MISSION SUPPORT

FISCAL YEAR 2002 ESTIMATES

BUDGET SUMMARY

OFFICE OF MANAGEMENT SYSTEMS **CONSTRUCTION OF FACILITIES**

SUMMARY OF RESOURCES BY APPROPRIATION

	FY 2000 OPLAN REVISED	FY 2001 OPLAN REVISED	FY 2002 PRES BUDGET	Page Number
		(Thousands of Dollars)		
Human Space Flight	16,376	15,865	17,300	MS 4-8
Science, Aeronautics and Technology	27,200	34,738	43,800	MS 4-14
*Mission Support	179,100	279,481	232,200	MS 4-20
Total	222,676	330,084	293,300	

**Beginning in FY 2002, Construction of Facilities contained within the Mission Support account will be allocated to the Human Space Flight (HSF) and the Science, Aeronautics and Technology (SAT) accounts based on the number for full time equivalent personnel within each Enterprise.*

PROGRAM GOALS

The goal of the Construction of Facilities (CoF) program is to ensure that the facilities critical to achieving NASA's space and aeronautics programs are constructed and continue to function effectively, efficiently, and safely, and that NASA installations conform with requirements and initiatives for the protection of the environment and human health.

STRATEGY FOR ACHIEVING GOALS

NASA facilities are critical to the shuttle, sustaining payload and launch operations, and for providing critical national aeronautical and aerospace testing capabilities, which support NASA, military and private industry users. NASA has conducted a thorough review of its facilities infrastructure finding that the deteriorating plant condition warrants an increased repair and renovation rate

to avoid safety hazards to personnel, facilities, and mission; and that some dilapidated facilities need to be replaced. Increased investment in facility revitalization is needed to maintain a facility infrastructure that is safe and capable of supporting NASA's missions. The Budget supports facilities funding to address these needs.

The Construction of Facilities (CoF) budget line item within Mission Support provides for discrete projects required for components of NASA's basic infrastructure and institutional facilities. Beginning in FY 2002, the funding contained within Mission Support will be allocated to the Human Space Flight (HSF) and Science, Aeronautics and Technology (SAT) accounts based on the number for full time equivalent personnel within each Enterprise. Almost all of these projects are capital repair. Mission Support also includes Minor Revitalization and Construction projects (projects greater than $500 thousand but not over $1.5 million), the design of facilities projects, and advanced planning related to future facilities needs. Funding for construction projects required to conduct specific HSF or SAT programs/projects is included in the appropriate budget line item. Descriptions and cost estimates are shown as part of the Construction of Facilities program to provide a complete picture of NASA's budget requirement for facilities.

Within the Human Space Flight appropriations account, the Space Shuttle FY 2002 budget request includes Discrete projects to restore the low voltage power system and refurbish the flame deflector and trench of Pad B at Kennedy Space Center; replace the chilled water, steam, and condensate systems of buildings 110 and 114 at Michoud Assembly Facility; and repair and modernize the A-Complex at Stennis Space Center. It also includes minor projects less than $1.5 million required to support specific programs. The Science, Aeronautics, and Technology appropriations account includes budget requests for discrete projects in: Space Science, to continue construction of the Beam Wave Guide antenna in Madrid, Spain; in Space Science and Earth Science, for a Flight Projects Center at the Jet Propulsion Lab; in Aerospace Technology, to construct a Rocket-Based Combined Cycle Test Facility at the Stennis Space Center; and in Biological and Physical Research, to continue construction of the Booster Applications Facility at Brookhaven National Laboratory.

The institutional projects that are shown as "Mission Support" in FY 2002 are for discrete projects to repair and modernize deteriorating and obsolete building and utility systems that have reached or exceeded their normal design life, are no longer operating effectively or efficiently, and cannot be economically maintained. These systems include mechanical, structural, cooling, steam, electrical distribution, sewer, and storm drainage at Ames Research Center, Dryden Flight Research Center, Glenn Research Center, Goddard Space Flight Center, Jet Propulsion Laboratory, Johnson Space Center, Langley Research Center, Marshall Space Flight Center, Michoud Assembly Facility, and Wallops Flight Facility. Also included is a project to connect the Madrid Deep Space Communications Complex to commercial Power; two projects to replace old dilapidated trailers and boxcars with new facilities at Kennedy Space Center, and a project to restore the parkway bridge at Goddard Space Flight Center. Should residual resources become available from these projects, they will be used for urgently needed facility revitalization requirements. Congress will be notified before work is initiated for any such project that exceeds $1.5 million.

The Minor Revitalization and Construction program included in this request continues the vital rehabilitation, modification, and repair of facilities to renew and help preserve and enhance the capabilities and usefulness of existing facilities and ensure the safe,

economical, and efficient use of the NASA physical plant. The Minor Revitalization and Construction program also replaces substandard facilities in cases where it is more economical to demolish and rebuild than it is to restore. In selected cases, additional square footage may be built when there are compelling reasons to support new or specialized technical and/or institutional requirements of a nature that cannot be provided by using existing facilities.

Funds requested for Facility Planning and Design cover advance planning and design requirements for potential future projects, preparation of facility project design drawings and bid specifications, master planning, facilities studies, and engineering reports and studies. Also included are critical functional leadership activities directed at increasing the rate of return of constrained Agency resources while keeping the facility infrastructure safe, reliable, and available.

Mission Support also includes the Environmental Compliance and Restoration (ECR) Program, which is critical to ensuring that statutory and regulatory environmental requirements and standards are met. NASA's environmental strategy demonstrates our commitment to protect the environment and provides for the protection and safety of human health. This commitment is achieved by focusing and directing our leadership and efforts into the principal areas of environmental compliance, remediation, restoration and conservation, and prevention. The requested funds cover environmental activities required for compliance with environmental statutory and regulatory requirements and standards, orders, regulatory and cooperative agreements and support of environmental program initiatives, including the decommissioning of the Plumbrook Reactor.

CONSTRUCTION OF FACILITIES

FISCAL YEAR 2002 ESTIMATES

SUMMARY OF BUDGET PLAN BY APPROPRIATION AND PROJECT

INSTALLATION AND PROJECT	FY 2000 OPLAN REVISED	FY 2001 OPLAN REVISED	FY 2002 PRES BUDGET	Page Number
		(Thousands of Dollars)		
HUMAN SPACE FLIGHT	16,376	15,865	17,300	
INTERNATIONAL SPACE STATION	4,056	---	---	
Space Experiment Research & Processing Laboratory (SERPL)	3,000	---	---	
Facility Planning and Design	1,056	---	---	
SPACE SHUTTLE	11,000	15,466	14,500	
Refurbish Pad B Flame Deflector and Trench (KSC)	---	---	2,200	MS 4-9
Restore Low Voltage Power System, Pad B (KSC)	---	---	2,000	MS 4-10
Replace Chilled Water, Steam, and Condensate Systems (110, 114) (MAF)	---	---	1,900	MS 4-11
Repair and Modernize A-Complex (SSC)	---	---	3,000	MS 4-13
Repair and Upgrade Substations 20A/20B (MAF)	---	1,796	---	
Restore Pad Surfaces and Slopes, Pad B (KSC)	1,800	---	---	
Refurbish Vehicle Assembly Building Elevator Controls	2,300	---	---	
Rehabilitate 480V Electrical Distribution System, ET Manufacturing Bldg. (MAF)	1,800	---	---	
Minor Revitalization of Facilities at Various Locations, Not in excess of $1.5 million per project	2,400	10,876	3,900	MS 4-42
Facility Planning and Design	2,700	2,794	1,500	
PAYLOAD AND ELV SUPPORT	1,320	399	2,800	
Minor Revitalization of Facilities at Various Locations, Not in excess of $1.5 million per project	1,000	---	2,700	MS 4-42
Facility Planning and Design	320	399	100	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 2002 ESTIMATES

SUMMARY OF BUDGET PLAN BY APPROPRIATION AND PROJECT

INSTALLATION AND PROJECT	FY 2000 OPLAN REVISED	FY 2001 OPLAN REVISED	FY 2002 PRES BUDGET	Page Number
		(Thousands of Dollars)		
SCIENCE, AERONAUTICS, AND TECHNOLOGY	27,200	34,738	43,800	
SPACE SCIENCE	2,500	7,198	20,500	
Construct Flight Projects Center (JPL)	---	---	13,500	MS 4-15
Construct 34-Meter Beam Waveguide Antenna, Madrid, Spain (JPL)	---	5,000	7,000	MS 4-16
Construct Optical Interferometry Development Laboratory (JPL)	2,500	490	---	
Facility Planning and Design	---	1,708	---	
BIOLOGICAL AND PHYSICAL RESEARCH	9,000	8,581	9,800	
Construct Booster Applications Facility, Brookhaven National Laboratory, Phase 5	9,000	8,581	9,800	MS 4-17
EARTH SCIENCE	1,000	---	1,500	
Construct Flight Projects Center (JPL)	---	---	1,500	MS 4-15
Restore Meteorological Development Laboratory (GSFC)	1,000	---	---	
AEROSPACE TECHNOLOGY	14,700	18,460	12,000	
Construct Rocket-Based Combined Cycle (RBCC) Test Facility (SSC)	4,000	9,978	12,000	MS 4-19
Replace Fan Blades, National Full-Scale Aerodynamic Complex (ARC)	3,400	5,987	---	
Construct Propulsion Research Laboratory (MSFC)	---	1,996	---	
Replace Main Drive for 14x22-Foot Subsonic Tunnel (LaRC)	7,300	---	---	
Facility Planning and Design	---	499	---	
SPACE OPERATIONS	---	499	---	
Facility Planning and Design	---	499	---	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 2002 ESTIMATES

SUMMARY OF BUDGET PLAN BY APPROPRIATION AND PROJECT

INSTALLATION AND PROJECT	FY 2000 OPLAN REVISED	FY 2001 OPLAN REVISED	FY 2002 PRES BUDGET	Page Number
		(Thousands of Dollars)		
MISSION SUPPORT CONSTRUCTION OF FACILITIES (CoF)				
Restore Electrical Distribution System (ARC)	2,700	8,980	8,900	MS 4-22
Rehabilitate and Modify Central Emergency Generator System (DFRC)	---	---	3,000	MS 4-23
Repair Sanitary Sewer System (GRC)	---	4,390	3,900	MS 4-24
Repair Site Steam Distribution System (GSFC)	2,900	3,991	4,000	MS 4-25
Restore Parkway Bridge (GSFC)	---	---	2,900	MS 4-26
Connect Madrid Deep Space Communications Complex to Commercial Power (JPL)	---	---	2,800	MS 4-27
Rehabilitate Aircraft Hangar, Ellington Field (JSC)	---	---	3,200	MS 4-28
Construct Operations Support Building, Pad A (KSC)	---	---	5,200	MS 4-30
Construct Operations Support Building II, LC-39 Area (KSC)	---	12,971	8,400	MS 4-31
Rehabilitate Atmospheric Sciences Building, 1250 (LaRC)	---	---	2,400	MS 4-32
Repairs to Air Conditioning Systems, Various Facilities (LaRC)	---	---	3,300	MS 4-33
Replace Heater, 20-inch Mach 6 CF4 Tunnel (LaRC)	---	---	3,500	MS 4-34
Rehabilitate Interior of Office and Laboratory Building (MSFC)	---	---	1,800	MS 4-36
Rehabilitate and Modify Productivity Enhancement Complex (MSFC)	---	---	3,600	MS 4-37
Rehabilitate Precision Cleaning Facility (MSFC)	---	---	2,100	MS 4-38
Repair and Upgrade Substations 31, 32, and 33 (MAF)	---	---	2,400	MS 4-39
Replace Roof, External Tank Manufacturing Building (MAF)	---	---	12,000	MS 4-40
Provide 34.5kV Alternate Feed to Substation G (GRC)	---	4,490	---	
Rehabilitate Distributed Control System (GRC)	---	2,994	---	
Restore Chilled Water Distribution System (GSFC)	3,900	4,989	---	
Replace Chillers, Space Flight Operations Facility (JPL)	---	1,796	---	
Upgrade 34M Beam Waveguide Antenna Subnet for KA-Band, Network (JPL)	---	1,896	---	
Rehabilitate Electrical Distribution System, 200 Area, WSTF (JSC)	---	2,495	---	
Construct Operations Support Building, Hypergol Maintenance Facility (KSC)	---	3,293	---	
Construct Operations Support Building, Pad B (KSC)	---	5,189	---	
Repairs to Primary Electrical Power System, (KSC)	---	3,492	---	
Repairs to Electrical Systems, East and West Areas (LaRC)	---	8,980	---	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 2002 ESTIMATES

SUMMARY OF BUDGET PLAN BY APPROPRIATION AND PROJECT

INSTALLATION AND PROJECT	FY 2000 OPLAN REVISED	FY 2001 OPLAN REVISED	FY 2002 PRES BUDGET	Page Number
		(Thousands of Dollars)		
MISSION SUPPORT CoF (Continued)				
Repair and Modernize Fluid Dynamics Vacuum Pump Facility (MSFC)	---	2,594	---	
Replace Roof, Building 4705 (MSFC)	---	1,397	---	
Replace Mechanical Equipment and Roof, Building 350 (MAF)	---	5,588	---	
Upgrade E-Complex Test Capabilities (SSC)	---	17,960	---	
Construct Propulsion Test Operations Facility (SSC)	---	10,477	---	
Repair Storm Drainage System (WFF)	---	2,694	---	
Rehabilitate Hangar, Building 4802 (DFRC)	2,900	---	---	
Rehabilitate High Voltage System (GRC)	7,600	---	---	
Upgrade 70M Antenna Servo Drive, 70M Antenna Subnet (JPL)	3,400	---	---	
Rehabilitate Utility Tunnel Structure and Systems (JSC)	5,600	---	---	
Connect KSC to CCAS Wastewater Treatment Plant (KSC)	2,300	---	---	
Rehabilitate High Pressure Storage System, LC-39 (KSC)	3,400	---	---	
Replace High Voltage Load Break Switches (KSC)	1,600	---	---	
Repair Roofs, Vehicle Component Supply Buildings (MAF)	2,000	---	---	
Replace Air Storage Field, 8-FT High Temperature Tunnel (LaRC)	10,000	---	---	
Minor Revitalization and Construction of Facilities at Various Locations, Not in excess of $1.5 million per project	77,900	109,256	86,700	MS 4-42
Facility Planning and Design	15,800	15,666	15,100	MS 4-48
Environmental Compliance and Restoration	37,100	43,903	57,000	MS 4-51
(Decommissioning of Plumbrook Reactor, included within ECR (GRC))	3,015	8,800	16,000	MS 4-55
Total Mission Support	179,100	279,481	232,200	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 2002 ESTIMATES

SUMMARY

HUMAN SPACE FLIGHT

INSTALLATION AND PROJECT	FY 2002 PRES BUDGET (Thousands)	Page Number
Space Shuttle:		
Refurbish LC-39B Flame Deflector and Trench (KSC)	2,200	MS 4-9
Restore Low Voltage Power System, LC-39B (KSC)	2,000	MS 4-10
Replace Chilled Water, Steam, and Condensate Systems (110, 114) (MAF)	1,900	MS 4-11
Repair and Modernize A-Complex (SSC)	3,000	MS 4-13
Minor Revitalization of Facilities at Various Locations, Not in excess of $1.5 million per project	3,900	MS 4-42
Facility Planning and Design	1,500	
Payload and ELV Support:		
Minor Revitalization of Facilities at Various Locations, Not in excess of $1.5 million per project	2,700	MS 4-42
Facility Planning and Design	100	
Total Human Space Flight	17,300	

PROJECT TITLE: Refurbish LC-39B Flame Deflector and Trench
COGNIZANT OFFICE: Office of Space Flight

INSTALLATION: Kennedy Space Center
LOCATION: Brevard County, Merritt Island, FL

FY 02 COST ESTIMATE (Thousands of Dollars):	2,200
Project Element:	
Orbiter Flame Deflector	550
SRB Flame Deflector	900
Steel Support Structure	200
Paint Steel Structure	550

PRIOR YEARS FUNDING:	176
Construction	----
Facility Planning and Design	176

PROJECT DESCRIPTION:
This project repairs the refractory concrete on the Solid Rocket Booster (SRB) and Orbiter flame deflectors at Launch Complex 39 Pad B (LC-39B). All of the refractory concrete on the SRB side and selected areas on the Orbiter side of the deflector will be replaced. Deteriorated refractory concrete on the flame trench walls and floors will also be replaced. The corrosion protection of the "toes" of the SRB and Orbiter deflectors will be repaired with reinforced portland cement concrete fill. Corroded structural steel on the flame deflector will be replaced. Structural steel on the flame deflector will be protected with a corrosion control coating.

PROJECT JUSTIFICATION:
The refractory concrete heat protection coating is fracturing from the launch environment, and large sections are breaking out. Structural steel supporting the flame deflector is corroding and deforming the coating support plates. This condition creates a significant risk of generating flying object debris, which can be detrimental to surrounding structures and launch support systems.

IMPACT OF DELAY:
Continued use of this launch pad with its flame deflector in its degrading condition puts the facilities and equipment at the launch pad at risk of serious flying debris damage during blastoffs.

PROJECT TITLE: Restore Low Voltage Power System, LC-39B, Phase 2
COGNIZANT OFFICE: Office of Space Flight

INSTALLATION: Kennedy Space Center
LOCATION: Brevard County, Merritt Island, FL

FY 02 COST ESTIMATE (Thousands of Dollars):	2,000	PRIOR YEARS FUNDING:	1,635
Project Element:		Construction	1,500
Electrical Substations and power distribution systems	2,000	Facility Planning and Design	135

PROJECT DESCRIPTION:
This project redesigns the power system at Launch Complex 39 Pad B (LC-39B) to consolidate, balance, and eliminate single point failures identified in the power System Assurance Analysis. Project includes replacement, refurbishment and/or repair of the existing deteriorating facility electrical power distribution system at LC-39B, including substations, switch gear, and power distribution circuits that are obsolete or in need of repair. A project study was performed to help define the obsolete equipment, explore alternate distribution schemes, and provide budget cost estimates. The project has been divided into work packages in which the work of each phase can be accomplished in a reasonably short time frame to lessen launch schedule impacts.

PROJECT JUSTIFICATION:
These electrical systems provide low voltage power to LC-39B. This project is essential to assure safe and reliable electrical power for KSC launch operations; payloads, shuttle, and space station processing; and administration/engineering support activities. Much of the existing electrical power distribution equipment was installed in 1965 during the Apollo era and has exceeded life expectancies. Equipment is obsolete, inefficient, and in need of major repair. Many parts required to maintain the systems are unavailable, and Apollo-era distribution schemes often do not efficiently support Shuttle program loads. Environmental factors of salt air, launch blast, Solid Rocket Booster residue, and extreme temperature changes all contribute to the continuing degradation of the deteriorated LC-39B electrical equipment. If a prime system component fails during pre-flight preparations, the launch schedule may slip. The deteriorated equipment and power cables present a serious risk of injury to maintenance and operation personnel.

IMPACT OF DELAY:
Continued operation of unreliable and unsafe electrical equipment at LC-39B increases the risk of injury to personnel, damage to property, and interruption of payload processing and launch operations. Operations and maintenance costs would stay excessively high. Personnel maintaining antiquated and unsafe electrical distribution equipment would continue to do so at risk of severe injury.

PROJECT TITLE: Replace Chilled Water, Steam, and Condensate Systems
COGNIZANT OFFICE: Office of Space Flight

INSTALLATION: Michoud Assembly Facility
LOCATION: New Orleans, Orleans Parish, LA

FY 02 COST ESTIMATE (Thousands of Dollars):	1,900
Project Element:	
Site Preparation and Demolition	190
Pipes/Valves and Fittings	900
Motors/Starters/Transmitters	90
Framing/Pipe Supports	80
Coils/Pumps/Circuit Setters	250
Condensate Stations/Fittings	90
Miscellaneous/Equipment Rental	300

PRIOR YEARS FUNDING:	312
Construction	----
Facility Planning and Design	312

PROJECT DESCRIPTION:
This project replaces and reconfigures chilled water, steam and condensate systems to meet current and future equipment requirements. New chilled water supply and return piping will be routed from the mechanical equipment room to the north side of the Vertical Assembly Building (VAB) and to the Building 103 booster pumps and central plant mains. New steam and condensate piping will be routed from the 190 Tank Farm area to the north side of the VAB equipment and receiver stations. The project will also provide for the replacement of condensate receiver stations, shut-off valves, strainers, and control valves.

PROJECT JUSTIFICATION:
External Tank (ET) production demands for chilled water, steam, and condensate changed substantially from 1963 (original installation was for production of the Apollo Saturn S1-C booster program). The inability to supply adequate chilled water to reach required temperature/humidity thresholds during an ET production process is a continuing problem which occurs during the hot and humid months of the year. It then becomes necessary to wait hours or days for the ambient conditions to moderate so ET processing activities can proceed in the cells. Chilled water, steam, and condensate return systems are crucial for the continuation of ET operations within the VAB. Chilled water is provided to the air handling units for the dehumidification inside the cells (requires 17%-18% relative humidity for spray operations). Steam/condensate is provided to the air handling units for heating inside the cells (requires 99° F cell environment and 196° supply temperature for tank heating).

The Vertical Assembly Building (VAB) chiller, located in Building 110 Mechanical Equipment Room, provides chilled water to the Building 110 heating, ventilation, air-conditioning (HVAC) systems for the critical cooling and dehumidification parameters within the production cell systems. Chilled water lines connect to the Building 103 plant chilled water system for emergency backup. Steam is supplied from the plant steam system originating from Building 207. Steam/condensate systems are instrumental in providing necessary heating for cell HVAC systems. The HVAC systems utilize this heating means to condition the air entering critical cell environments and also prepare the surface temperature of the ET for foam application. The VAB steam condensate receiver stations and liquid movers for returning hot condensate back to the main Boiler House have also deteriorated. This causes back-ups, leakage, and reduced condensate feedwater for the boilers. Building 110 is the Vertical Assembly Building used for major

assembly, Thermal Protection System ablator application, testing, and cleaning of the LH2 and LO2 tanks. Both the chilled water system and the steam/condensate systems were originally installed in 1963, making the majority of the systems almost 40 years old. The chilled water system capacity is unable to meet present year-round demands due to limitations imposed by existing piping system resistance and internal pipe corrosion. Current capacity and flow of chilled water delay ET production processing due to inability to meet stringent environmental parameters. The chiller supplying chilled water to Building 110 operates at full capacity during the summer in an attempt to maintain designed parameters in all critical cell environments.

IMPACT OF DELAY:
Continued degradation of system components and prolonged loss of chilled water, steam, or condensate would impact ET production activities and impact critical ET schedules. Also, delays in ET processing result from increased waiting times required to meet critical temperature and humidity requirements for spray operations in the cells.

PROJECT TITLE: Repair and Modernize A-Complex
COGNIZANT OFFICE: Office of Space Flight

INSTALLATION: Stennis Space Center
LOCATION: Bay St. Louis, MS

FY 02 COST ESTIMATE (Thousands of Dollars)	3,000
Project Elements:	
Electrical Repair	600
Mechanical Repairs	1,000
Structural Repairs	200
Mechanical Modifications	800
Structural Modifications	400

PRIOR YEARS FUNDING:	13,200
Construction	3,000
Facility Planning and Design	200

PROJECT DESCRIPTION:
This project repairs and modifies the basic infrastructure of the A-1 Test Stand to enable its use for Space Shuttle Maine Engine (SSME) testing. Repairs to mechanical systems such as air system and crane works will be accomplished. Repairs to various structural systems such as the concrete flume, structural steel, barge docks and flame bucket will also be completed. The deluge water supply system will be replaced as well as modification to other piping systems. Repairs to electrical and mechanical systems at the Test Control Center will be performed. Structural and mechanical modifications to A-2 will also be accomplished.

PROJECT JUSTIFICATION:
A-2 is the primary test stand for SSME certifications testing. It is severely over-subscribed and no “downtime” is available to perform significant infrastructure upgrades that are required from a safety and supportability perspective. Upgrading the A-1 test stand to accomplish SSME testing allows these necessary repairs to A-2 to be aggressively pursued in future budgets without impacting program schedules. Completion of this project will allow SSME testing to be transferred to A-1 while A-2 is undergoing its own repairs, and afterwards will provide an on-going backup capability.

The A-Complex is over 30 years old and has not had a significant rehabilitation since the early 1970’s. Structural elements of the stand continue to deteriorate due to inaccessibility for routine maintenance. Replacement parts are no longer available for major mechanical and electrical components on the stand. Preliminary risk management assessment indicates this restoration will significantly reduce program risks to safety, schedule, and cost.

IMPACT OF DELAY:
If a failure of facilities should occur on A-2 Test Stand, the SSME program would be delayed with no backup Test Stand (A-1). Delay of the certification testing would impact future Shuttle launch schedules resulting in costs exceeding the cost to restore this complex to a reliable condition. Without the capability to transfer SSME testing to A-1, necessary repairs and upgrades to A-2 cannot be accomplished. This could result in unsafe conditions on the A-2 test stand causing personal injury and equipment loss.

CONSTRUCTION OF FACILITIES

FISCAL YEAR 2002 ESTIMATES

SUMMARY

SCIENCE, AERONAUTICS, AND TECHNOLOGY

	Amount (Thousands)	Page Number
Space Science		
Construct Flight Projects Center, Phase I (JPL)	13,500	MS 4-15
Construct 34-Meter Beam Waveguide Antenna, Madrid, Spain (JPL)	7,000	MS 4-16
Biological and Physical Research		
Construct Booster Applications Facility, Brookhaven National Laboratory, Phase 4	9,800	MS 4-17
Earth Science		
Construct Flight Projects Center, Phase I (JPL)	1,500	MS 4-15
Aerospace Technology		
Construct Rocket-Based Combined Cycle (RBCC) Test Facility (SSC)	12,000	MS 4-19
Total Science, Aeronautics, and Technology	43,800	

PROJECT TITLE: Construct Flight Projects Center, Phase 1
INSTALLATION: Jet Propulsion Laboratory
COGNIZANT OFFICE: Office of Space Science
LOCATION: La Canada-Flintridge, Los Angeles County, CA

FY 02 COST ESTIMATE (Thousands of Dollars)	15,000
Project Elements:	
Sitework	1,000
Structural	10,000
Architectural	2,000
Mechanical	1,000
Electrical	1,000

PRIOR YEARS FUNDING:	750
Construction	---
Facility Planning and Design	750

PROJECT DESCRIPTION:
This project constructs a 12,000 gross square meter (GSM) building on the southeast corner of Surveyor and Mariner Roads that will provide offices, conference rooms, and support facilities for approximately 800 people. A structural steel framework will support concrete over steel deck floor and roof slabs. The building exterior will be a high performance glass and aluminum curtain wall system with a single ply membrane roof. Heating, ventilating, and air-conditioning (HVAC) and electrical equipment will be modern high efficiency units in fully integrated, digitally controlled systems. Forty-four wooden trailers (2,100 GSM) and six 1940s vintage buildings (4,000 GSM) will be demolished, and approximately 100 parking spaces will be added. We plan to use the Design-Build procurement methodology for this project. A second and final phase estimated at $20 million is required in FY 2003 to complete this facility. Non-construction funding in the amount of $5.5 million will be budgeted to furnish and outfit the building.

PROJECT JUSTIFICATION:
The need to collocate and centralize Flight Program and Project Management functions is vital to the success of JPL missions. Currently, flight program/project personnel are scattered across the Center and in expensive off-site leased space. Approximately 1100 personnel are relocated each year to collocate the skills needed to meet mission requirements. This repetitive movement of personnel costs $3M/year and significantly hinders mission accomplishment. This new building will increase project development efficiency, enhance communications, provide a true teaming environment, provide shared common resources, result in quicker and more efficient dissemination of lessons learned among projects, and allow multiple program/project functions to share experts. The new building will make optimal use of scarce building sites at JPL, ease the over crowded conditions at the Oak Grove campus, and allow demolition of substandard trailers and buildings that are costly to operate and maintain. Missions can be accomplished more effectively, efficiently, and safely while improving employee morale. Expensive off-site leased space will be vacated and the need for additional off-site leases will be avoided. This helps meet NASA's objective to minimized off-site leases. Annual costs of $4-5 million for modular units and off-site leases will be avoided.

IMPACT OF DELAY:
Flight Program and Project Management functions would continue to be accomplished inefficiently with potentially adverse affect to missions. Costly repetitive personnel relocations would still be required. Employees would continue to work in substandard trailers and buildings that are very costly to operate and maintain. Personnel would continue to occupy increasingly expensive off-site leased space, with additional leased space required. Employee effectiveness, efficiency, and moral would continue to be at risk.

PROJECT TITLE: Construct 34-Meter Beam Waveguide Antenna, Phase 2
COGNIZANT OFFICE: Office of Space Science

INSTALLATION: Jet Propulsion Laboratory
LOCATION: Madrid Deep Space Communication Complex (MDSCC), Madrid, Spain

FY 02 COST ESTIMATE (Thousands of Dollars)	7,000
Project Elements:	
Antenna Construction	6,250
Facilities Construction	750

PRIOR YEARS FUNDING:	5,175
Construction	5,000
Facility Planning and Design	175

PROJECT DESCRIPTION:
This project constructs a 34-Meter Beam Waveguide (BWG) Multi-Frequency Antenna at the Madrid Deep Space Communication Complex near Madrid, Spain. The project fabricates and installs the antenna structure, panels, gearboxes, bearings, electric drives, encoders, beam wave-guide mirrors, subreflector and subreflector positioner. It also designs and constructs the foundation and pedestal, as well as all facilities in and around the antenna structure and pedestal. This includes the paved access road; trenches; drainage; flood control devices; water main and distribution system; antenna apron security fence; heating, ventilating, and air-conditioning system; electrical power distribution; fire detection and suppression system; and surveillance system assembly. This is the second and final increment of this $12 million project. The first increment of $5 million is being submitted as a FY 2001 Operating Plan change. Non-construction funding in the amount of $21 million will be budgeted for equipment and outfitting of this facility.

PROJECT JUSTIFICATION:
This project is required to meet the communications data load requirement for the growing number of planned deep space missions. The DSN currently supports the Deep Space Missions of Cassini, Deep Space 1, Galileo, Mars Global Surveyor, Stardust, Ulysses, and Voyager Interstellar. Future missions requiring DSN support include the Mars Missions (Mars Odyssey Orbiter, Mars Twin Orbiters and Rovers, Mars Reconnaissance Orbiter, Mars Mobile Science Lab, Mars Scout, Mars Science Orbiter, Mars Sample Return), Deep Impact, Europa Orbiter, Genesis and Rosetta Orbiter. The tracking commitments of the DSN during the 2003-2004 time frame and approximately every 26 months thereafter require more antenna resources than currently available. This 34 Meter BWG Antenna needs to be operational by November 2003 in order to support the increased network loading which will be placed on the Deep Space Network (DSN) during 2003-2004.

IMPACT OF DELAY:
If this project is not accomplished, the Deep Space Network will be unable to accommodate the scheduled increase in data load required to support the future spacecraft missions currently planned. Without adequate support from the DSN, the deep space missions will be unable to download all the valuable data that each mission is intended to collect.

PROJECT TITLE: Construct Booster Applications Facility, Phase 5
COGNIZANT OFFICE: Office of Biological and Physical Research

INSTALLATION: Brookhaven National Laboratory
LOCATION: Long Island, NY

FY 02 COST ESTIMATE (Thousands of Dollars)	9,800
Project Elements:	
Booster Modifications	1,500
Beam Transport System	2,500
Controls and Personnel Safety System	1,100
Experimental Area Outfitting	1,600
Installation and Services	1,100
Project Services	1,300
Spares	700

PRIOR YEARS FUNDING:	21,381
Construction*	21,381

*Prior year construction funds include Facility Planning and Design and Special Test Equipment

PROJECT DESCRIPTION:
This project constructs a Booster Applications Facility (BAF) adjacent to the existing Brookhaven National Laboratory (BNL) Alternating Gradient Synchrotron (AGS) Booster. Conventional construction includes site clearing and preparation; new roads and parking areas; booster wall penetration; tunnel construction with access/egress corridors at both ends of the tunnel; and construction of two pre-engineered metal buildings, one for protecting power supplies and switchgear, and the other to provide laboratory workspace. The project modifies the AGS Booster to accommodate installation of hardware required to perform slow extraction. Booster modifications include relocation of the beam dump and a wall current monitor; installation of new septum magnets; provision of new power supplies; rewiring for higher currents; and reconfiguration of existing vacuum chambers. The project constructs a 63-meter Beam Transport System (BTS) in the new tunnel capable of providing a 20-degree bend (to eliminate direct line-of-sight) between the booster ring and the target area, and capable of distributing the beam over a 15-centimeter x 15-centimeter target area. The BTS consists of a 10-centimeter diameter vacuum pipe with a thin window in front of the target and a fast-closing valve to protect the booster vacuum from a window break; magnetic elements to transport and shape the beam on target; a cooling system using low conductivity water; and cable trays and cabling for direct current (DC) power and controls. The project includes all distributed systems, central services, and process controls required for operation of the BAF, including a relay-based personnel access control system that permits entrance to radiation areas only when safe to do so. The project upgrades one of the two existing BNL Tandem accelerators to 16 megavolts and modifies it to enable concurrent use by AGS and BAF. The project provides for outfitting of the experimental areas of research in biological systems, including dosimeters, computer systems, and other electronic equipment. Project provides for all supporting infrastructure and utilities. This is the fifth increment of this $34 million project. Construction funds in the amount of $2.8 million will be requested in FY03 to complete the project.

PROJECT JUSTIFICATION:
The BAF will provide a ground-based facility in which to conduct important research aimed at understanding and assessing health risks and developing effective countermeasures against galactic cosmic radiation. Such a capability does not currently exist. The BAF will provide the capability to simulate all major ion components and energies of the galactic cosmic rays and solar proton events. Once the

BAF becomes operational, BNL will provide NASA access to more than 2,000 beam-hours-per-year in order to meet all of the goals of NASA's Strategic Program Plan for Space Radiation Health Research.

The BAF will benefit the International Space Station (ISS) by providing a ground-based facility for meeting operational, scientific, and technology goals in radiation protection. The BAF will provide a capability for accurate calibration of radiation detectors used to monitor crewmember exposures on ISS and verify doses as regulated by OSHA. It will also provide a facility for developing shielding augmentation for ISS, which would increase astronaut safety and extend crew stays. The BAF will enable critical research and measurements for assessing health risks from heavy-ions that comprise up to 50 percent of the biological dose on ISS. Acquiring this scientific knowledge will allow NASA to maximize crew stay times and reduce costs from excessive crew changes.

The National Research Council and the National Council of Radiation Protections and Measurements in independent reviews have informed NASA that the scientific basis to estimate risk from galactic cosmic radiation during long-term space flight does not exist. The BAF will benefit long-duration missions by providing a unique ground-based facility in which to conduct critical research to obtain knowledge of potential health effects and for the development of ground analogs, biological countermeasures, and radiation shielding strategies.

IMPACT OF DELAY:
Deferral or cancellation of this project would greatly impact NASA's ability to pursue vital research on space radiation effects required to enable development of maximum-exposure guidelines and of radiation countermeasures such as shielding. NASA's ability to safely extend crew stays at the ISS and other potential future long-duration space flights would be severely curtailed or eliminated. Delay of this project would also delay our ability to calibrate radiation detectors without which NASA cannot accurately monitor ISS crewmembers' exposure to radiation. These impacts will translate into increased ISS operations cost due to more frequent crew changes, to preclude increased risk to astronauts due to limited knowledge of space radiation effects.

PROJECT TITLE: Construct Rocket Based Combined Cycle (RBCC) Test Facility, Phase 3 INSTALLATION: Stennis Space Center
COGNIZANT OFFICE: Office of Aerospace Technology LOCATION: Bay St. Louis, MS

FY 02 COST ESTIMATE (Thousands of Dollars)	12,000	PRIOR YEARS FUNDING:	13,978
Project Elements:		Construction	12,978
Buildings	1,200	Facility Planning and Design	1,000
Piping and Valves	6,000		
Pressure Vessels	4,800		

PROJECT DESCRIPTION:
This project provides for the design and construction of a "free jet" facility to test up to a 50,000 pounds of thrust rocket engine with a maximum of Mach 0.75 air supply system. Construction will include the sitework, test cell structure, a structure for a Test Control Center (TCC), offices, and a high-bay area for engine preparation and storage. The project will also include installation of gas and cryogenic storage and transfer systems. Project scope includes supporting infrastructure and utilities. This is the third and final increment of this $26 million project.

PROJECT JUSTIFICATION:
The potential benefits of Rocket Based Combined Cycle (RBCC) engines over traditional rocket propulsion have been considered for many years. The primary benefit is the improvement in payload mass fraction resulting in less cost per pound to orbit RBCC technologies must be matured and the maturing process will require ground testing due the complex interactions of chemical kinetics, fluid mechanics and compressible flow effects that occur in RBCC engines.

The RBCC Program requires testing of a rocket engine and possible engine clusters to simulate flight conditions at subsonic conditions. This testing is critical to the engine prototype development and future production testing of the engine. A testing facility is required for sea level testing, sea level free jet testing to Mach 0.75 and altitude testing. No facility is currently available for testing criteria for this type of technology. A Government-owned facility will provide control of facility availability, control of test readiness on a day-to-day basis, and enhanced understanding of the interactions between facility and test article (engine) including air heating and storage systems, thrust measurement systems, and controls and data acquisition systems. The RBCC propulsion test facility will have high productivity goals. Initial estimates are 10 tests per month.

IMPACT OF DELAY:
A delay of this project would prevent development of the technologies necessary to accomplish the Aerospace technologies goal to revolutionize space launch capabilities, reducing payload cost to low-cost orbit by an order of magnitude during the period of 2003-2009 in accordance with the NASA Strategic Plan.

CONSTRUCTION OF FACILITIES

FISCAL YEAR 2002 ESTIMATES

SUMMARY OF RESOURCES REQUIREMENTS

MISSION SUPPORT

INSTALLATION AND PROJECT	FY 2000 OPLAN REVISED	FY 2001 OPLAN REVISED	FY 2002 PRES BUDGET	Page Number
		(Thousands of Dollars)		
Discrete Projects	48,300	110,656	73,400	MS 4-21
Minor Revitalization and Construction	77,900	109,256	86,650	MS 4-42
Facility Planning and Design	15,800	15,666	15,150	MS 4-48
Environmental Compliance and Restoration	37,100	43,903	57,000	MS 4-51
TOTAL	179,100	279,481	232,200	
Distribution of Program Amount by Installation				
Johnson Space Center	17,538	33,451	22,620	
Kennedy Space Center	32,492	48,802	27,960	
Marshall Space Flight Center	21,344	32,232	34,650	
Stennis Space Center	9,930	45,397	10,870	
Ames Research Center	11,901	21,559	21,900	
Dryden Flight Research Center	7,216	5,825	8,500	
Glenn Research Center	19,396	29,800	32,530	
Langley Research Center	19,845	17,952	22,030	
Goddard Space Flight Center	19,780	24,213	22,105	
Jet Propulsion Laboratory	14,372	16,898	24,135	
Headquarters	5,286	3,352	4,900	
TOTAL	179,100	279,481	232,200	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 2002 ESTIMATES

SUMMARY

MISSION SUPPORT

	Amount (Thousands)	Page Number
Mission Support Discrete Projects:		
Restore Electrical Distribution System (ARC)	8,900	MS 4-22
Rehabilitate and Modify Central Emergency Generator System (DFRC)	3,000	MS 4-23
Repair Sanitary Sewer System (GRC)	3,900	MS 4-24
Repair Site Steam Distribution System (GSFC)	4,000	MS 4-25
Restore Parkway Bridge (GSFC)	2,900	MS 4-26
Connect Madrid Deep Space Communications Complex to Commercial Power (JPL)	2,800	MS 4-27
Rehabilitate Aircraft Hangar, Ellington Field (JSC)	3,200	MS 4-28
Construct Operations Support Building, Pad A (KSC)	5,200	MS 4-30
Construct Operations Support Building II, LC-39 Area (KSC)	8,400	MS 4-31
Rehabilitate Atmospheric Sciences Building, 1250 (LaRC)	2,400	MS 4-32
Repairs to Air Conditioning Systems, Various Facilities (LaRC)	3,300	MS 4-33
Replace Heater, 20-inch Mach 6 CF4 Tunnel (LaRC)	3,500	MS 4-34
Rehabilitate Interior of Office and Laboratory Building (MSFC)	1,800	MS 4-36
Rehabilitate and Modify Productivity Enhancement Complex (MSFC)	3,600	MS 4-37
Rehabilitate Precision Cleaning Facility (MSFC)	2,100	MS 4-38
Repair and Upgrade Substations 31, 32, and 33 (MAF)	2,400	MS 4-39
Replace Roof, External Tank Manufacturing Building (MAF)	12,000	MS 4-40
Total Discrete Projects	73,400	

PROJECT TITLE: Restore Electrical Distribution System, Phase 4
COGNIZANT OFFICE: Office of Aerospace Technology

INSTALLATION: Ames Research Center
LOCATION: Moffett Field, Santa Clara County, CA

FY 02 COST ESTIMATE (Thousand of Dollars)	8,900
Project Elements:	
Replace High Voltage Switchgear and Transformers	1,500
Expand Ames Power Monitoring System	1,900
Install Standby Generation	5,500

PRIOR YEARS FUNDING:	14,661
Construction	13,900
Facility Planning and Design	761

PROJECT DESCRIPTION:
This project will modernize and repair the Center's primary electrical distribution system as part of a phased program to improve reliability. This is the fourth of approximately ten phases estimated to cost $50M. This phase replaces medium voltage switchgear and transformers in 13 buildings. Nine of the buildings will get new medium voltage (7.2kV and 13.8kV) switchgear, circuit breakers, transformers; microprocessor based protective relays, and current and potential transformers (CT's and PT's) to allow connection to the new Ames Power Monitoring System. The other four buildings will get new relays, and CT's and PT's. The Ames Power Monitoring System (APMS) will be expanded to provide monitoring of the major office buildings. It will cover approximately 84 buildings with an actual total of approximately 50 hardware points (some of the buildings share the same points.) This phase also installs a 3.2 mega-watt Standby Generation/Un-interruptible Power Supply (UPS) to provide clean and continuous power for the Numerical Aerodynamic Simulation Facility (N258). Fuel storage tanks will be installed to provide extended hours of continuous operation. New 13.8kV switchgear, with the associated CT's, PT's, transformers, and relays will also be installed to interface the UPS to the existing N258 power system.

PROJECT JUSTIFICATION:
The existing 1945 vintage, Center-wide electrical system at Ames is worn out and unreliable. As a result, Ames has experienced increasing instances of power interruptions that have adversely impacted critical research. The old switchgear is unsafe to operate, and it is difficult to maintain because replacement parts are no longer available. New microprocessor based protective relays are more precise which will make for better relay coordination. New potential and current transformers are needed to provide data for the new Ames Power Monitoring System. The existing APMS data transmitted is not dependable and the accuracy of measurement is unpredictable. In addition to previous phases of the APMS task that allowed the monitoring of the major research facilities, this phase will connect the remaining major buildings to provide complete measurement and management of the electrical system at Ames. The APMS is a vital tool in today's rapidly changing and sometimes unreliable electric power supply environment. The Numerical Aerodynamics Simulation (NAS) facility is required to provide services on a 24-hour/7-day basis. Due to the rapidly changing electric power supply landscape, the electric utilities can no longer be depended upon to provide a reliable supply of power for the NAS. A UPS system is the only viable solution to ensure clean and uninterrupted electric power for this vital facility.

IMPACT OF DELAY:
Risk of injury to personnel maintaining hazardous switchgear and transformers would continue. In addition, power outages caused by electrical equipment failure would continue to not only adversely interrupt mission-critical research across the Center, but also prevent the Center from operating in an efficient, cost effective manner.

PROJECT TITLE: Rehabilitate and Modify Central Emergency Generator System
COGNIZANT OFFICE: Office of Aerospace Technology

INSTALLATION: Dryden Flight Research Center
LOCATION: Kern County, CA

FY 02 COST ESTIMATE (Thousands of Dollars)	3,000
Project Elements:	
Generators & Collateral Equipment	1,550
Switchgear	700
Generator Housing	500
Connect to Existing System	200
Testing and Startup	50

PRIOR YEARS FUNDING:	240
Construction	---
Facility Planning and Design	240

PROJECT DESCRIPTION:
This project installs a multi-generator diesel-electric standby power plant along with associated cooling, fueling, and control systems and a dual primary system with redundant switching circuits. Also included are installation of primary/secondary bus and switchgear, power control system, protective relaying, transfer switches and transformers, interconnection with existing distribution system, generator housing to increase lifetime and reduce noise, testing, and startup.

PROJECT JUSTIFICATION:
Dryden's electrical power is supplied by a single 115,000 volt overhead branch pole-line from a commercial utility station over twenty miles away. It flows through an unsheltered transformation/switch station and continues overhead to the Dryden site. The overhead line is exposed to high desert winds, ravens, and hunters using the insulator for target practice causing short circuits. These conditions, plus occasional system-wide problems, cause Dryden to experience several power failures each year, jeopardizing the safety and effectiveness of the Center's flight research mission. The existing 1950's standby generators are obsolete, underpowered, and require manual start-up and synchronization. Dryden has grown tremendously since the 1950's and now has critical research and support operations throughout the site.

IMPACT OF DELAY:
Without this project, the activities of over a thousand people at Dryden would continue to be interrupted by avoidable electrical power failures. Loss of electrical power could jeopardize flight safety and could cause loss of flight research data and even loss of a mission.

PROJECT TITLE: Repair Sanitary Sewer System, Phase 4
COGNIZANT OFFICE: Office of Aerospace Technology

INSTALLATION: Glenn Research Center
LOCATION: Cleveland, OH

FY 02 COST ESTIMATE (Thousands of Dollars)	3,900
Project Elements:	
East Campus Loop	2,500
Building 28 Area Lines	1,400

PRIOR YEARS FUNDING:	4,762
Construction	4,238
Facility Planning and Design	524

PROJECT DESCRIPTION:
This project is the fourth of five phases to repair the aging sanitary sewer system. The scope includes replacing sewer mains, eliminating cross connections between sanitary and storm water systems, and repair/installing oil-water separators. It also includes excavation, backfill, and pavement repair necessary to replace sewer lines and manholes. It will improve the hydraulics of the system, greatly reduce maintenance and operating costs, and eliminate noncompliance discharges to the storm outfalls. Funds will be requested in for phase 5 in the future to restore other segments of the sewer system.

PROJECT JUSTIFICATION:
The existing sanitary sewer system is more than fifty years old and is in poor condition. This project will reduce treatment and maintenance costs associated with operating the aging sanitary sewer system and eliminate nonconformance discharges to storm outfalls. This project will reduce maintenance costs by reducing the need for emergency repairs on broken lines. It will reduce treatment costs by reducing inflow and infiltration into the sanitary sewer. In addition, it will eliminate noncompliance discharges to storm outfalls caused by broken sanitary lines and cross connections to comply with National Pollution Discharge Elimination System permits.

IMPACT OF DELAY:
Without the project, avoidable and costly treatment of storm water discharged through the sanitary sewer system would continue. In addition, continued breaks and blockages in sewer lines are increasingly more likely to occur, requiring costly emergency repairs. Continued noncompliance notices could result in increased inspection, increased monitoring, and fines by the Ohio EPA.

PROJECT TITLE: Repair Site Steam Distribution System, Phase 4
COGNIZANT OFFICE: Office of Earth Science

INSTALLATION: Goddard Space Flight Center
LOCATION: Greenbelt, MD

FY 02 COST ESTIMATE (Thousands of Dollars)	4,000
Project Elements:	
East Campus Loop	1,400
Building 28 Area Lines	900
West Campus West Loop	900
Building Supply Line	300
Mid Campus Loop	500

PRIOR YEARS FUNDING:	9,185
Construction	8,900
Facility Planning and Design	285

PROJECT DESCRIPTION:
This project is the fourth of five phases to repair major portions of the central steam distribution system at Goddard Space Flight Center. The scope includes installing a pipeline loop for the East Campus; replacing pipelines in the vicinity of Building 28; replacing the West Campus pipeline loop; replacing the supply pipelines serving various buildings; and replacing the Mid Campus pipeline loop.

PROJECT JUSTIFICATION:
The central steam distribution system was originally installed in the early 1960s and is at the end of its useful life. The system has deteriorated to the point that corrosion is causing pipes to break and valves to leak. Concrete access portals are deteriorated from steam and condensate leakage causing damage to the surrounding landscape and roadway. The site steam distribution system has become undersized due to substantial growth in buildings and related steam demand. The added steam loads on the East Campus require significant upsizing of the main headers. Some condensate and high-pressure drip lines have failed resulting in waste of water, energy and treatment chemicals. In addition, the leakage of condensate to ground water is in violation of environmental regulations. Extensive insulation failures have resulted in energy losses and damage to site landscaping and pavement. This project will reduce operation and maintenance costs and enhance reliability as well as the ability to maintain the site steam distribution system.

IMPACT OF DELAY:
A major failure could occur in the campus-wide steam distribution system, resulting in the loss of steam supply to several buildings. This would seriously impact critical operations in those buildings that could include spacecraft mission operations and control and spacecraft tracking networks control. The delay will also increase operation and maintenance costs necessary to keep the deteriorated system operational.

PROJECT TITLE: Restore Parkway Bridge
COGNIZANT OFFICE: Office of Earth Science

INSTALLATION: Goddard Space Flight Center
LOCATION: Greenbelt, MD

FY 02 COST ESTIMATE (Thousands of Dollars)	2,900
Project Elements:	
Bridge	2,320
Roadway Approaches	580

PRIOR YEARS FUNDING:	225
Construction	---
Facility Planning and Design	225

PROJECT DESCRIPTION:
This project rehabilitates the Goddard Space Flight Center Parkway Bridge to extend the life of the structure for another 30 years. The bridge consists of 16-foot wide roadways in each direction separated by a 4-foot wide raised median, with 1.5-foot safety curb on the outside of each roadway. It has a 7-inch reinforced concrete deck covered by a 2-inch bituminous wearing surface. The substructure consists of reinforced concrete stub abutments and solid shaft piers. The bridge deck and abutment walls will be removed and replaced. Approach roadways will be reconstructed. One lane will remain open throughout the construction period.

PROJECT JUSTIFICATION:
The Parkway Bridge, built in 1966, is 35 years old. Recent inspection and testing reveal that time and road salts have caused significant deterioration to the concrete and corrosion to the reinforcing steel. The rate of deterioration increases with time due to the existing road salt contamination. The remaining safe lifetime for the bridge is uncertain, and advancing deterioration could require its immediate closure in the near future. Closure of the bridge would have a significant impact on the area roadway network by curtailing Center access through the gate at the parkway. This would significantly add to the near capacity traffic currently using Greenbelt Road.

IMPACT OF DELAY:
Delay of the project would require increasing yearly investments of maintenance, repair, and inspection funds to maintain the bridge in a safe and operational status. Completion of the project will reduce and largely eliminate any yearly bridge maintenance for the next 10 years.

PROJECT TITLE: Connect Madrid Deep Space Communications Complex (MDSCC) to Commercial Power

INSTALLATION: Jet Propulsion Laboratory

LOCATION: Madrid Deep Space Communication Complex, MDSCC, Madrid, Spain

COGNIZANT OFFICE: Office of Space Science

FY 02 COST ESTIMATE (Thousands of Dollars)	2,800
Project Elements:	
Electrical	2,280
HVAC	60
Power Controls	60
Converter/Transformer Building	300
Modify Existing Heat Recovery System	100

PRIOR YEARS FUNDING:	224
Construction	---
Facility Planning and Design	224

PROJECT DESCRIPTION:

This project will link the MDSCC to commercial electrical power, eliminating single point of failure, reducing near term replacement costs of old diesel engine generators, reducing operation and maintenance costs, and providing emergency backup electrical power. Commercially supplied electrical power will be provided by connecting to the local electrical power grid at the Navalagamella Substation, Spain. The contractor will install a 20KV overhead transmission line. This line will carry the power approximately 16.8 km from the Substation to MDSCC. This effort includes installation of power poles and routing of the transmission line. The new overhead lines will transition to underground lines directly outside the Complex. From there the transmission line will run to a new power converter/ transformer building. The project will modify existing Complex power distribution system to accommodate the automatic transfer from commercial power to Complex-generated power and vice versa. This will be accomplished by the installation of new switchgear and programmable automated controls. The project includes construction of a power converter/transformer building. The building will house the necessary 50/60 HZ frequency converter equipment and hardware, and the step down transformers and switchgear. The new single story high bay prefabricated building will be approximately 400 square meters. Its control room and other equipment areas will be air conditioned to meet equipment requirements. The building will include power distribution, lighting, associated equipment and a 15-ton crane for heavy equipment.

PROJECT JUSTIFICATION:

MDSCC presently operates solely on electrical power generated at the complex. This creates a single point of failure. If operation continues in the same in-house generation mode, the 35-year old diesel engine generators will require replacement beginning in 2003. The switch to commercial power as the prime source of power will relegate the existing generators to a back-up role. This will slow the degradation of the generators, extending their useful lives, and significantly delay the need for their replacement. The emergence of the European Union may result in the imposition of far-reaching, restrictive emission levels. The switch to commercial electrical power at MDSCC will substantially reduce the emission of air pollutants, obviating non-compliance with future environmental regulations.

IMPACT OF DELAY:

Without a commercial power source, electrical power generated at MDSCC would continue to be a single point of failure. The generators would continue to degrade, resulting in higher maintenance costs and replacement of the generators beginning in 2003. Without reducing the emissions of air pollutants MDSCC may fail to comply with European air quality management directives.

PROJECT TITLE: Rehabilitate Aircraft Hangar, Ellington Field
COGNIZANT OFFICE: Office of Space Flight

INSTALLATION: Johnson Space Center, Ellington Field
LOCATION: Houston, TX

FY 02 COST ESTIMATE (Thousands of Dollars):	3,200
Project Element:	
Construction	3,200

PRIOR YEARS FUNDING	280
Construction	----
Facility Planning and Design	280

PROJECT DESCRIPTION:
This project refurbishes, upgrades and constructs of a two-story, steel-framed addition on the east side of the existing aircraft maintenance hangar E135 at Ellington Field, Houston, TX. It also renovates electrical, heating ventilating and air conditioning equipment, and architectural systems on the west side of the hangar. The existing two-story 8,000 square feet, 5-year-old steel frame, wood construction office wing will be demolished. The new addition will add a gross area of approximately 10,000 square feet. A freight elevator and a new sidewalk will be installed. In order to maintain uninterrupted astronaut/pilot training, either the construction will be phased to assure continuous aircraft operations and maintenance or a temporary facility will be provided during construction to house existing operations, engineering, and maintenance personnel. First story space in the addition will include aircraft maintenance offices used in support of four Shuttle Training Aircraft (STA), administrative aircraft (G159 & G1159) and training aircraft (T-38N), flight crew support spaces, and an aircraft simulator facility. The space will house personnel, computer equipment with networking, a T-38N simulator, aviation test equipment powered by multiple power sources, a technical publications library, a technical documentation production facility, a break room, a physical training facility, and a personnel locker room. Second story space will include aircraft engineering, operations, and information technology offices and a conference room in support of all JSC Aircraft Operations. They will house personnel, computer equipment with networking, computer servers, engineering and drafting equipment, and audio-visual equipment. A built-up roof system will be installed, along with a fall protection system. Fire protection will be provided throughout the facility. Miscellaneous site work includes adding 30 parking spaces for new personnel. The area between the hangar addition and the ramp will be paved with concrete. The project also provides for replacement of the main hangar doors. The renovation work on the west side will include installation of a personnel elevator to provide access to the second floor. HVAC repairs will include replacement of various air-cooled condensing units, air handler units, and boilers. The restrooms will also be refurbished.

PROJECT JUSTIFICATION:
This project is required to replace substandard aircraft operations support facilities and provide additional space for increased operational staff and equipment required for ongoing Shuttle missions and expanding Space Station support functions. This pre-World War II era hangar and its major elements are critically overdue for renovation. The east wing, which is to be demolished, has been damaged by termites. The wood structure is 57 years old, and asbestos is present throughout the facility in walls, floor tile, and insulation. Indoor air quality is poor, evidenced by the mildue stained ceiling tile and HVAC duct. Interior office walls have deteriorated from moisture and mildew. No elevator facilities exist for handicapped personnel. The roof is also in poor condition.

The new space is required to enable/accommodate the following activities. It will host the T-38N Simulator Facility required to provide annual emergency procedures training to astronauts and Aircraft Operation Division (AOD) T-38 pilots. This training is presently conducted at USAF simulator sites that will no longer be available after FY02. No other suitable space is available at

Ellington Field. Off-Site location of the facility would be costly and inefficient. Aircraft engineering civil service and contractor personnel will be relocated to E135 to improve the efficiency of the engineering function, as it will then be located in the area where most field activities occur. That will free up space in Hangar 990 on the north tract of NASA property at Ellington Field to provide research space for the WB-57 and KC-135 flight research programs currently located in the Hangar 990 areas. Existing astronaut and other aircrew locker rooms are fully occupied, and further expansion is required. Specifically, as the number of female astronauts has increased, and with expected further increases, an adequate female locker room is required. The Information Technology function at AOD has expanded from five personnel to 20 with further growth expected. The growth is in part due to the increased reliance on IT for aircraft maintenance, logistics, and operations management and in part due to Aircraft Operations being assigned a lead role and sustaining support of NASA aircraft logistics and maintenance IT development and implementation.

IMPACT OF DELAY:
Delaying this project would impact operational support for both Space Shuttle and Space Station programs in addition to allowing further deterioration of the structure and further extending substandard housing conditions. Delay of this project would result in significant increases in maintenance expenditures to correct these conditions without long term improvement of the substandard conditions. Additionally, the AOD consolidation plans will be delayed, resulting in continued operational inefficiencies and shortfalls.

PROJECT TITLE: Construct Operations Support Building, Pad A Area
INSTALLATION: Kennedy Space Center
COGNIZANT OFFICE: Office of Space Flight
LOCATION: Brevard County. Merritt Island, FL

FY 02 COST ESTIMATE (Thousands of Dollars):	5,200
Project Element:	
Site Work and Utilities	400
Architectural and Structural	2,300
Mechanical	1,300
Electrical	1,200

PRIOR YEARS FUNDING:	320
Construction	----
Facility Planning and Design	320

PROJECT DESCRIPTION:
This project constructs an Operations Support Building in the Launch Complex 39 Pad A (LC-39A) Area. The facility will be approximately 25,000 square feet, and accommodate approximately 100 technicians and engineers that provide 3-shift processing support. The new facility will be of permanent masonry construction and will have offices, training rooms, and technical documentation storage. Facility systems to be included are heating, ventilation, and air conditioning (HVAC); electrical power; natural gas; water and sewage; fire detection and protection; and paging and area warning systems. The project will also upgrade the existing central utilities and control systems in order to support the new facility. Non-construction funding in the amount of $700,000 will be budgeted to provide for systems furniture, communication systems, computer equipment, and other such outfitting and activation costs.

PROJECT JUSTIFICATION:
This project replaces approximately 40 dilapidated boxcar units (approximately 22,000 square feet) temporarily being used to provide office and operations support space for approximately 100 workers supporting launch pad processing and test and checkout operations. The substandard workspace consists of 50-year-old railroad boxcars that were modified and converted to office use almost 20 years ago. The heavy salt corrosive environment of Florida's Atlantic coast has aggressively attacked and severely corroded these boxcars. The units have greatly exceeded their intended useful service life. Due to significant structural degradation, these boxcars have become maintenance intensive. The severe state of degradation of these units creates a poor workplace environment that adversely affects worker morale and productivity and could potentially affect their safety and health. Trailers, boxcars and other modular buildings at KSC have 24 times more environmental health complaints than comparable permanent facilities at KSC. The extreme state of disrepair of these boxcars is contributing to intensive and unscheduled maintenance having excessive costs; highly inefficient and costly energy consumption; and working environments that barely meet minimum safety and health standards for occupancy. This project is essential to assure a safe and healthy workplace environment for engineers and technicians performing critical operations work affecting timely and reliable launch of the Space Shuttle.

IMPACT OF DELAY:
People performing day-to-day Shuttle support would continue to work in deteriorated, grossly substandard conditions, which adversely affects their morale and productivity, and could potentially affect not only their health and safety, but also the quality of their work for the Shuttle. Operations and maintenance costs and energy consumption would stay excessively high. Productivity would continue at lower levels also because people working on the same activities are not in close proximity to each other.

PROJECT TITLE: Construct Operations Support Building II, LC-39 Area, Phase 2
INSTALLATION: Kennedy Space Center
COGNIZANT OFFICE: Office of Space Flight
LOCATION: Brevard County, Merritt Island, FL

FY 02 COST ESTIMATE (Thousands of Dollars):	8,400
Project Element:	
Site Work and Utilities	1,000
Architectural and Structural	3,000
Mechanical	2,000
Electrical	2,400

PRIOR YEARS FUNDING:	15,371
Construction	12,971
Facility Planning and Design	2,400

PROJECT DESCRIPTION:
This project provides for the construction of a second Operations Support Building in the LC-39 Vehicle Assembly Building (VAB) area. The complex will be approximately 200,000 square feet and accommodate approximately 1,000 workers. The complex will support operational areas and consist of offices, training rooms, computer rooms, multi-media conference rooms, Mission Conference Center with observation deck, technical libraries, Exchange storage, snack bar, storage, miscellaneous support areas and parking. Facility systems to be included are heating, ventilation, and air conditioning (HVAC); electrical power; natural gas; water; sewage; fire detection and protection; and paging and area warning systems. The project will also upgrade the existing central utilities and control systems in order to support the new complex. This is the second and final increment of this $21.4M project. Non-construction funding in the amount of $14 million will be budgeted to provide for systems furniture, communication systems, computer equipment, and other such outfitting and activation costs.

PROJECT JUSTIFICATION:
A critical need exists to eliminate 280 trailer equivalents of dilapidated substandard housing affecting the safety, morale and welfare of approximately 700 Shuttle processing workers, transient Launch fallback personnel, and personnel who attend training. This project allows consolidation of fragmented programs affecting approximately 300 workers currently scattered across the Center supporting LC-39 operations and Spaceport Technology Center strategies. Additional substandard housing will be eliminated when vacated permanent housing currently being used by the fragmented programs is backfilled. KSC's heavy salt corrosive environment has aggressively attacked and severely corroded the existing 20-year-old portable office trailers and modified railroad boxcars. These units have mold and indoor air quality problems; rotting and termite infested siding and floor substructures; roof and siding that leak; plumbing that does not drain properly; tripping hazards, such as uneven floors and exterior stairs that are wobbly and unstable; and numerous other code violations. Trailers and modular housing have 24 times more environmental health complaints than comparable permanent facilities. This contributes to intensive and unscheduled maintenance having excessive costs; highly inefficient and costly energy consumption; and working environments that barely meet minimum safety and health standards.

IMPACT OF DELAY:
People would continue to work in deteriorated, grossly substandard conditions, which adversely affects morale and productivity, and could potentially affect their health and safety. Maintenance would continue to cost approximately $1.3 million/year more than for conventional permanent facilities and 47% more energy would continue to be consumed. Productivity would continue at lower levels also because people working on the same program are not in close proximity and have to travel greater distances.

PROJECT TITLE: Rehabilitate Atmospheric Sciences Building
COGNIZANT OFFICE: Office of Aerospace Technology

INSTALLATION: Langley Research Center
LOCATION: Hampton, VA

FY 02 COST ESTIMATE (Thousands of Dollars)	2,400
Project Elements:	
Rehab of B1250 & 1ST floor addition:	
Architectural/Civil/Structure	400
Mechanical/Electrical	1,000
Rehab of 2ND & 3RD floors & elevators:	
Architectural/Civil/Structure	500
Mechanical/Electrical	500

PRIOR YEARS FUNDING:	142
Construction	---
Facility Planning and Design	142

PROJECT DESCRIPTION:
This project rehabilitates space in Building 1250 and provides a connection between Building 1250 and 1250A to meet Americans with Disabilities Act (ADA) requirements and space utilization guidelines. This project will modify and repair the existing facility to provide new heating, ventilating, and air-conditioning, electrical equipment, and a new fire suppression system to comply with NASA Safety requirements. The ADA requirements include modifications to existing restroom facilities and a new elevator to allow disabled access. Interior space modifications will be performed to consolidate personnel and to upgrade interior finishes that have surpassed their useful lives. This project will also eliminate at least one of the temporary trailers currently housing personnel.

PROJECT JUSTIFICATION:
Langley currently has substantial workforce housed in substandard space, including Building 1250. The Atmospheric Sciences Division (ASD) anticipates growth of approximately 20 civil servants and a need to accommodate up to 20 visiting scientist at any one time. Laboratory space is urgently needed to accommodate on-going and future flight instrument development, calibration, and checkout. ASD must be able to host visiting scientists from the international pool of universities and other government agencies engaged in the environmental sciences. The building systems are critical to the operations in this facility and affect productivity, operational costs, and code compliance.

IMPACT OF DELAY:
Inadequate facilities would negatively impact ASD's ability to maintain and enhance its world-class leadership in atmospheric remote sensing. People would continue to work in deteriorated substandard facilities, which adversely affects morale and productivity, and could potentially compromise the safety of personnel and property. Operations and maintenance costs and energy consumption would remain excessively high.

PROJECT TITLE: Repairs to Air Conditioning Systems, Various Facilities
COGNIZANT OFFICE: Office of Aerospace Technology

INSTALLATION: Langley Research Center
LOCATION: Hampton, VA

FY 02 COST ESTIMATE (Thousands of Dollars)	3,300
Project Elements:	
Building 1239C:	
Architectural, General, Controls & Electrical	400
HVAC System	900
Building 1299:	
Architectural, General, Controls & Electrical	750
HVAC System	1,100
Sprinkler System	150

PRIOR YEARS FUNDING:	532
Construction	---
Facility Planning and Design	532

PROJECT DESCRIPTION:
A new variable air volume (VAV) system comprised of fan powered VAV terminal units with a hot water reheat coil will be utilized in Building 1299 and 1293C. A variable speed air handler with a variable frequency drive will be installed in the mechanical room and utilize chilled water from the existing air-cooled package chillers. A steam to hot water converter will provide hot water to the VAV heating coils. A direct digital control system will allow control and monitoring from Building 1215. The existing absorption chiller will be replaced with a new package unit in Building 1293C. The chiller will use the existing underground water lines. The cost includes piping modifications, new chilled water controls, and new chilled water pump. This project also replaces the control system and installs equipment for dehumidification and pre-treatment of the make-up air. The fume hood industrial exhaust and make-up air will be replaced. This equipment is needed to bring the facility up to standard.

PROJECT JUSTIFICATION:
It has been determined that the status quo is not an option since it cannot provide the required life safety and process requirements needed for the facilities to pursue new work and accomplish their missions. These air conditioning units have reached the end of their useful lives. The equipment is old, unreliable, and incapable of performing under stress, such as maintaining consistent temperature levels in the summertime. The fume hood system deficiencies do not maintain the required exhaust face velocities and make-up air to meet current safety and industrial ventilation requirements and standards. The number of service calls is increasing and maintenance costs are high. The majority of this equipment was identified for replacement by the Facility Assessment Review conducted in 1993.

IMPACT OF DELAY:
People would continue to work in deteriorated substandard facilities, which adversely affects morale and productivity and could compromise the health and safety of personnel. The air conditioning and fume hood systems are critical to the operations in these facilities. Failure of this equipment affects performance and making emergency repairs is expensive and causes significant disruptions.

PROJECT TITLE: Replace Heater 20" Mach 6, CF4 Tunnel
COGNIZANT OFFICE: Office of Aerospace Technology

INSTALLATION: Langley Research Center
LOCATION: Hampton, VA

FY 02 COST ESTIMATE (Thousands of Dollars)	3, 500
Project Elements:	
Heater System	2,300
Building Demolition	100
Building Modifications	400
Building Power Distribution	200
Heater System Installation	350
CF4 Process Modifications	150

PRIOR YEARS FUNDING:	80
Construction	---
Facility Planning and Design	80

PROJECT DESCRIPTION:
The existing storage will be replaced with a reliable, efficient, and environmentally compatible gas-filled heating system. The project involves the procurement of a new combustion heater and the necessary building modifications for installation. The new natural gas combustion heater will have two heat exchangers in series. The first is a combustion-fired unit, which uses combustion products to convectively heat the outside of a coiled tube with CF4 gas flowing on the inside. The second heat exchanger is unfired, but uses the combustion products of the first unit to preheat a second coiled tube, to add thermal capacitance to the system. The proposed heater system is a combination storage/continuous heater. Architectural, civil, structural, electrical and mechanical changes will be made to Building 1275. A second floor will be added to the facility, which will be at least 16 feet high and cover 1,200 square feet. The heater would penetrate through the existing ceiling and extend into the new second floor addition. A separate enclosure will be constructed around the heater, with its own heating and ventilation system. The new second floor addition will be tied in to the existing structure and insulated steel metal siding added.

PROJECT JUSTIFICATION:
The 20-Inch, Mach 6, CF4 Tunnel became operational in 1975 and is a unique National resource that simulates the high density ratio (low ratio of specific heat) aspect of a real gas on aerodynamic performance of earth and planetary vehicles; it is the only heavy gas hypersonic wind tunnel in the Nation and the World. The current tunnel heater system is a storage type and has used either molten lead, molten tin or salt (currently) as the storage media. CF4 is heated via tube bundles immersed in the molten material. Tube failures have occurred releasing lead vapors and contaminants. Internal corrosion of the tubes has produced unacceptable levels of free stream flow particulates. The present salt-bath system lacks versatility, requires long start-up and turn around times, is relatively inefficient, has a restricted temperature range, and cannot maintain a steady reservoir temperature over the required test period. This unique facility is used to certify the aerodynamic performance characteristics of future blunt and moderately blunt aerospace vehicles for advanced space transportation systems programs such as X-33, Advanced Technology Demonstrator and X-34, Small Reusable Booster, and all other Government Agency, industry, and university hypersonic vehicle concepts. The tunnel operates synergistically with four other hypersonic facilities at LaRC to develop flight simulation parameters.

IMPACT OF DELAY:
Delay of this project results in continued risk of heater failure and inefficient system operation. This wastes energy and increases costs. A 6-12 month shutdown caused by failure of the heating system would be unacceptable to the programs involved in four synergistically operated hypersonic facilities.

PROJECT TITLE: Rehabilitate Interior of Office and Laboratory Building
COGNIZANT OFFICE: Office of Space Flight

INSTALLATION: Marshall Space Flight Center
LOCATION: Madison County, Alabama

FY 02 COST ESTIMATE (Thousands of Dollars):	1,800
Project Element:	
Architectural	600
Mechanical	1,000
Electrical	200

PRIOR YEARS FUNDING:	144
Construction	----
Facility Planning and Design	144

PROJECT DESCRIPTION:
This project rehabilitates approximately 17,000 square feet at the east end of A-wing in Building 4487. Through improved architectural, mechanical, and electrical upgrades, the project will convert part of A-wing into functionable computer room and office spaces. The new doors, hardware, carpeting, vinyl composition tile, ceilings and painting will match the existing areas. New raised flooring will be provided in the computer room. The heating, ventilating and air-conditioning (HVAC) work shall consist of the demolition and replacement of the system. Unused high-pressure gas lines will be removed. New drain lines and piping will be provided as required to support the new HVAC systems. The sprinkler system will be upgraded and existing lighting, power, and communication equipment/devices within the project area will be demolished and replaced. Asbestos and lead abatement are also required.

PROJECT JUSTIFICATION:
This project renovates the only portion of the 43-year old Building 4487 that has not been previously renovated. When the other portions of the building were renovated, critical operations within this area prevented renovation work. However, with the removal of large mainframe computer and data systems from this area, it can now be rehabilitated and made available to satisfy an increasing demand for additional office space. As a result of a recent reorganization, approximately 150 additional personnel (40% increase) are to be added to Building 4487, thus critically increasing the need for additional usable office space. Currently, this floor space is relatively unusable because the area has raised flooring in marginal condition, poorly suited HVAC systems, outdated electrical systems, and inadequate fire protection.

IMPACT OF DELAY:
This area was recently cleared of obsolete mainframe computers; is served by outdated HVAC, sprinkler, and electrical systems; and is essentially unusable. If the rehabilitation is not done, this portion of the building would continue to be unusable and unavailable to satisfy increased office space requirements. Personnel would have to be located in a facility remote from their related work groups which would decrease their efficiency and ability to collaborate. Office space would likely have to be leased from a commercial entity off the Center due to limited administrative space on the Center.

PROJECT TITLE: Rehabilitate and Modify Productivity Enhancement Complex
COGNIZANT OFFICE: Office of Space Flight

INSTALLATION: Marshall Space Flight Center
LOCATION: Madison County, Alabama

FY 02 COST ESTIMATE (Thousands of Dollars):	3,600
Project Element:	
Architectural	1,800
Mechanical	1,100
Electrical	400
Structural	300

PRIOR YEARS FUNDING:	288
Construction	----
Facility Planning and Design	288

PROJECT DESCRIPTION:
This project rehabilitates MSFC's Productivity Enhancement Laboratory (Building 4707). Restoration work includes new insulation; floor surfacing; repair or replacement of door components; repairs and modifications to the heating, ventilating, and air conditioning equipment; relocation of an exhaust system; electrical power distribution and lighting improvements; and interior repairs and painting. A new fire suppression system will be installed to reduce fire hazards in this heavily used development laboratory. Modifications in the Filament Winding area of the building will include raising the height of approximately 5,000 square feet of ceiling to match the height of the adjacent Tape Laying Laboratory area and replacing a 5-ton overhead crane with a 15-ton capacity crane to serve both the filament winding and tape laying laboratories.

PROJECT JUSTIFICATION:
Building 4707 is 44 years old and contains approximately 103,000 square feet of combination high bay and low bay laboratory space. The building is critical to many of NASA's technology development and productivity enhancement initiatives. This facility serves as a model of NASA's new way of doing business in respect to reliability, energy efficiency, and safety. Many of the building's system components have exceeded their design life or are inadequate to satisfy existing requirements or operational improvements. The restoration work will improve reliability, reduce energy costs, and modernize the building to match its function. Improvements to the Filament Winding Facility are required for the fabrication of larger composite structures under improved environmental controls. There is currently no crane in the filament-winding laboratory that can handle large tooling and fabricated structures.

IMPACT OF DELAY:
Delay of this project will cause Building 4707 to continue to deteriorate, increase unplanned disruptions, and prevent safety improvements and optimum use of the facility. With this facility serving as a model of NASA's new way of doing business, reliable operation and energy and safety upgrades are imperative. The Filament Winding Facility will be impacted by restricting the fabrication of large composite structures. Without the new crane, lift trucks and other ground support equipment must be used and this limits the number of fabrication operations that can be performed in the facility. Furthermore, composite structures fabricated in the laboratory are extremely sensitive to contaminants generated by fork trucks and other lift vehicles.

PROJECT TITLE: Rehabilitate Precision Cleaning Facility
COGNIZANT OFFICE: Office of Space Flight

INSTALLATION: Marshall Space Flight Center
LOCATION: Madison County, Alabama

FY 02 COST ESTIMATE (Thousands of Dollars):	2,100
Project Element:	
Architectural	200
Mechanical	1,500
Electrical	400

PRIOR YEARS FUNDING:	168
Construction	----
Facility Planning and Design	168

PROJECT DESCRIPTION:
This project restores the capabilities of the Precision Cleaning Facility (PCF) located in Building 4705. The scope of this project includes improved environmental control; new cleaning consoles; upgraded air-locks for the clean rooms; heating ventilating, and air-conditioning improvements; new plumbing; hoist modifications; utility gas distribution; and improved lighting. This work will restore the clean room level in the main cleaning area to a cleanliness level of 30K in accordance with Center and Federal standards. In addition, room B124 will be restored to its design cleanliness level of 4K.

PROJECT JUSTIFICATION:
Flight hardware and fixtures fabricated at the center are processed through the PCF to provide a quick turn-around frequently required to meet the various projects' schedule and budget constraints. Projects affected by the facility's ability to meet requirements include the Material Science Research Rack (MSRR), the Quench Module Insert (QMI) and various projects from the Environmental Control and Life Support Systems (ECLSS) organization. The facility has deteriorated to the point where items often require multiple cleanings to achieve the required flight hardware cleanliness level due to the inability of the various components of the PCF to maintain the respective clean room levels of 30K and 4K stated above. This is inefficient in terms of both schedule delays and operational cost increases. Facility systems and subsystems, such as lightning, consoles, pumps, valves and controls, have deteriorated from approximately thirty years of use and chemical exposure. The impact of the current lower cleanliness rating is a high probability of contamination of parts and delayed hardware deliveries.

IMPACT OF DELAY:
Without repair or replacement work, deterioration of the PCF in Building 4705 will continue, maintenance costs will increase and the facility will no longer be able to support the required parameters of the projects. Further neglect will result in more frequent schedule delays for flight hardware and increased costs for precision cleaning due to the multiple cleanings required. Ultimately, the PCF will likely be forced to shut down and items will have to be shipped to other cleaning facilities with the associated increases in transportation risks, costs and schedule delays.

PROJECT TITLE: Repair and Upgrade Substations 31, 32, and 33
COGNIZANT OFFICE: Office of Space Flight

INSTALLATION: Michoud Assembly Facility
LOCATION: New Orleans, Orleans Parish, LA

FY 02 COST ESTIMATE (Thousands of Dollars):	2,400
Project Element:	
Site Preparation and Demolition	80
Switchgear and Breakers	735
Motor Control Centers, Switchboards, and FDR Sections	300
Wires and Cable Terminations	700
Transformers & High Voltage Switches	400
Miscellaneous Fittings and Components	185

PRIOR YEARS FUNDING:	192
Construction	----
Facility Planning and Design	192

PROJECT DESCRIPTION:
This project replaces three substations (#31, #32, and #33) located on the roof of Bldg. 350. Each substation will be upgraded to a 1500 kVA double-ended configuration. The primary switches, transformers, switchgears, including main and tie breakers will be replaced, and Programmable Logic Control (PLC) interfaces for the control of emergency power transfer of each substation will be provided. The high voltage 13.8 kV sectionalized switches will be replaced, as well as associated feeders #18 and #39. Associated PLC controlled emergency power transfer and energy management monitoring capabilities will also be replaced. The new system will be compatible with the existing 13.8kV feeders.

PROJECT JUSTIFICATION:
The manufacturer of the original sectionalized switches is out of business, and parts are no longer available. Failure of these switches impacts the entire power distribution of Building 350. The switchgear and breakers have obsolete parts requiring replacement components to be custom built to rigid specifications. Transformers are PCB-contaminated, posing a potential environmental impact. Substation loads are nearing, and in some cases exceeding, the capacity of the transformers. The substations are located on Building 350 roof and provide power to Building 350 for general HVAC, United States Department of Agriculture (USDA) data hardware, UPS for Consolidated Computer Operation Center, LAN File Server Room, telecommunications, NASA offices, emergency storm drainage pumps and sewer lift station. Building 350 provides space to NASA, Defense Contract Audit Agency, Defense Contract Management Agency, USDA, National Finance Center, Lockheed Martin and other agencies. The substations and their associated equipment were installed in 1964, and the majority of the systems are over 35 years old. Expected substation 31 loads exceed the transformer capacity. Substation 33 is reaching the limit of its capacity to reliably meet present conditions. The transformers have been refilled five times since 1988 attempting to reduce PCB concentrations. Periodic testing show the transformers continue to exceed maximum allowable PCB level of 50 ppm, forcing us to refill them every two years.

IMPACT OF DELAY:
The Substations are vital to continuation of 24 hours per day operations of various departments located in Building 350. If the systems are not replaced, maintenance costs and delays would continue to increase. Failure of a main breakers would stop work activities of building occupants, and critical computer operations equipment would lose power. Continued use of antiquated and obsolete equipment risks severe injury to maintenance personnel from electrical arcing, and continues the risk of PCB leakage.

PROJECT TITLE: Replace Roof, External Tank Manufacturing Building, Phase 1
COGNIZANT OFFICE: Office of Space Flight

INSTALLATION: Michoud Assembly Facility
LOCATION: New Orleans, Orleans Parish, LA

FY 02 COST ESTIMATE (Thousands of Dollars):	12,000
Project Element:	
Site Preparation and Demolition	2,300
Precast Concrete Panels/Moisture Control	800
Lightweight Purlins/Fasteners	300
Roof Deck Insulation/Foamglass	2,000
Built-up Roofing	1,900
Reflective Coating	1,200
Membrane Roofing	2,600
Miscellaneous/Equipment Rental	600
Piping/Lightning Protection	300

PRIOR YEARS FUNDING:	360
Construction	----
Facility Planning and Design	360

PROJECT DESCRIPTION:
This project is the first of two phases to replace Building 103 roofing system (1,679,200 square feet) and roof drainage piping. Components of the roofing system to be replaced include deteriorated timber purlins (replaced using light gauge steel); damaged concrete planks; base sheet; 4-ply built-up felt system; glaze coat and reflective topcoat. Repairing the roof drainage piping involves removing/replacing downspouts, as well as using lining material to repair a portion of the downspouts that are inaccessible. The horizontal run-outs that connect the downspouts to roof drains will also be replaced. Cast iron/galvanized pipe will be replaced with PVC or fiberglass pipe to ensure reliability. Funds in the amount of $12M will be budgeted in FY03 to complete this project.

PROJECT JUSTIFICATION:
Building 103, the "External Tank Manufacturing Building," was constructed in 1943. It is primarily used for Shuttle External Tank assembly (chemical cleaning, component cleaning, component painting, harness fabrication, heat treating, machining, riveting, tube fabrication, and welding) and new business (X33, RLV, and NCAM). Building 103 has a roof area of approximately 40 acres. An in-house study completed in September 1998 found the roof to be deteriorated beyond the capabilities of a major maintenance restoration project. Roof leaks that can cause damage to production equipment and flight hardware and injury to personnel if not addressed are occuring throughout various areas of the building. Surface deficiencies and a high moisture content were also found.

Building 103 also has approximately 100 downspouts for draining rainwater from the roof. The fire water system and air handling units also drain into the downspouts. The downspouts penetrate the floor slab and tie into the main storm drainage pipes that run to the Borrow Canal. During severe rainfall, storm water is forced out of faulty joints and runs out onto the factory floor and utility trenches. This creates hazardous conditions to personnel. Temporary repairs are made on damaged downspouts to stop leaks. Approximately 40% of the downspouts are not accessible because electrical panels or other equipment block access to them. Horizontal run-outs connect the downspouts to the roof drains. There are three different types of run-outs: cast iron, galvanized, and fiberglass. The majority of leaks in Building 103 stem from the horizontal run-outs. Cracks form on the top of the cast iron

pipe making them unnoticeable until rainwater leaks. Holes form around the galvanized pipe and allow rain to infiltrate the building. Several repairs are made on these run-outs during periods of severe weather.

IMPACT OF DELAY:
Failure to replace roofing system could result in risk to personnel safety, and potentially extensive and costly damage to flight hardware and production equipment. As the downspouts, horizontal run-outs and 4-ply roof continue to deteriorate, more leaks will occur.

PROJECT TITLE: Minor Revitalization and Construction of Facilities, Not in Excess of $1.5 million Per Project
COGNIZANT OFFICE: Office of Management Systems LOCATION: Various

	Mission Support	Human Space Flight
FY 02 COST ESTIMATE (Thousands of Dollars)	86,700	6,600
Location:		
Ames Research Center	10,300	
Dryden Flight Research Center	4,200	
Glenn Research Center	10,100	
Goddard Space Flight Center	13,100	
Jet Propulsion Laboratory	11,700	
Johnson Space Center	9,900	
Kennedy Space Center	4,900	6,600
Langley Research Center	10,000	
Marshall Space Flight Center	3,200	
Stennis Space Center	9,300	

PROGRAM DESCRIPTION:
Proposed projects for FY 2002 are identified under "MINOR PROJECT COST ESTIMATE". They include Mission Support projects totaling $88.1 million for components of the basic infrastructure and institutional facilities, and $5.9 million to accomplish specific Human Space Flight projects. The $5.9 million is included in the appropriate budget line items of the Human Space Flight appropriation. The cost estimates are shown here to provide a complete picture of NASA's budget requirement for facilities.

These resources provide for revitalization and construction of facilities at NASA field installations and Government-owned industrial plants supporting NASA activities. The request includes facility revitalization and construction needs for FY 2002 that are greater than $500 thousand but not in excess of $1.5 million per project. Revitalization projects provide for the repair, modernization, and/or upgrade of facilities and collateral equipment. Repair and modernization projects restore facilities and components thereof, including collateral equipment, to a condition substantially equivalent to their originally intended and designed capability. Repair and modernization work includes the substantially equivalent replacement of utility systems and collateral equipment necessitated by incipient or actual breakdown. It also includes major preventive measures that are normally accomplished on a cyclic schedule, and those quickly needed out of cycle based on adverse condition information revealed during predictive testing and inspection efforts. Upgrade projects may include not only some restoration of current functional capability, but also enhancement of the condition of a facility so that it can more effectively accomplish its designated purpose or increase its functional capability. Occasionally minor facility construction projects will be required to provide for either the construction of small new facilities or

additions to existing facilities. The facilities being revitalized or constructed in this program are expected to remain active in the long term and are consistent with current and anticipated Agency roles and missions. Annual funding will be required for continuing minor revitalization and construction needs.

This program includes revitalization and construction projects estimated to cost more than $500 thousand per project. Projects $500 thousand and less in magnitude are normally accomplished by routine day-to-day facility maintenance and repair activities provided for in Research Operations Support and direct program operating budgets. Projects estimated to cost more than $1.5 million are included as separate discrete projects in the budget request.

PROGRAM JUSTIFICATION:

NASA is experiencing "block obsolescence" because 90% of the agency's facilities have been in use for over 25 years. Repair costs for mechanical and electrical systems in a typical building are almost three times higher after system operations exceed 15-20 years than they are during the initial years. Many electrical and mechanical components reach the end of their serviceable or economic life at the 20-year point and should be replaced. Continued piecemeal repair of these components is more costly in the long run than replacement at the end of the economic life of the original components.

The NASA physical plant has a capital investment of over $6 billion with a current replacement value of more than $20 billion. A continuing program of revitalization of these facilities is required to accomplish the following:

a. Protect the capital investment in these facilities by minimizing the cumulative effects of wear and deterioration.
b. Ensure that these facilities are continuously available and that they operate at peak efficiency.
c. Improve the capabilities and usefulness of these facilities and thereby mitigate the effects of obsolescence.
d. Provide a better and safer environment for all personnel.
e. Reduce current operating costs and avoid significantly greater future repair costs.

New construction will primarily replace substandard facilities in cases where it is more economical to demolish and rebuild than it is to restore. Included are projects that replace old and dilapidated railroad box cars, trailers, and other modular facilities that do not meet current occupational health and safety standards, and which no longer satisfy user functional requirements. In selected cases, additional square footage may be built when there are compelling reasons to support specialized requirements of a nature that cannot be provided for using existing facilities. Included in this latter category are technical, programmatic, and institutional projects that are essential to the accomplishment of an installation's mission objectives.

MINOR PROJECT COST ESTIMATE (Thousands of Dollars):

The projects that comprise this request are of the highest priority based on relative urgency and expected return on investment. Deferral of this mission-essential work would adversely impact the availability of critical facilities and program schedules. The titles of the projects are designed to identify the primary intent of each project and may not always capture the entire scope or description of each project. Also, during the year, some rearrangement of priorities may be necessary which may force a change in some of the items to be accomplished. Any such changes, however, will be accomplished within total the resources available.

HUMAN SPACE FLIGHT	6,600
A. Kennedy Space Center (KSC)	6,600
1. Restore Low Voltage Power System, LC-39A, Phase II (Space Shuttle)	1,500
2. Refurbish Rotating Service Structure Drive Trucks, LC-39A (Space Shuttle)	1,200
3. Refurbish Rotating Service Structure Drive Trucks, LC-39B (Space Shuttle)	1,200
4. Modernize Launch Vehicle Data Center, Vandenberg Launch Site (ELV)	1,200
5. Upgrade Mobile Service Tower and Pad Lighting, Vandenberg Launch Site SLC-2 (ELV)	750
6. Repair and Modernize HVAC, Payload Hazardous Servicing Facility, Phase I (Payload Carriers)	750
MISSION SUPPORT	86,700
A. Ames Research Center (ARC)	10,300
1. Rehabilitate and Modify 20MW Power Supply, Phase III	825
2. Rehabilitate Arc Jet Water Cooling System, Phase II (N234)	1,450
3. Seismic and Safety Modifications, Phase II (19)	1,450
4. Replace First Floor HVAC Systems (N233)	700
5. Repair North and South Central Steam Vacuum System Plenum Shells	825
6. Fire Suppression/Alarm and Seismic Modifications (N241)	1,050
7. Repair Roofing and HVAC Systems (N236, Wings A &B)	1,150
8. Modify Developmental Arc Jet Facility for 5MW Arc Jet Heater (N234)	1,450
9. Construct Perimeter Security Fence	1,400
B. Dryden Flight Research Center (DFRC)	4,200
1. Repair Infrastructure, Phase II (4800)	1,400
2. Rehabilitate and Modify Electrical Distribution System (4840)	1,350
3. Refurbish Area A Ramp	1,450

C. Glenn Research Center (GRC)	10,100
1. Repair Natural Gas System, Phase III	1,200
2. Install 450 PSIG Heater, Propulsion Systems Laboratory (125)	900
3. Rehabilitate and Modify Engineering Building, Plum Brook Station [PBS] (7141)	1,200
4. Install Cryopumping System, Space Power Facility (1411), PBS	1,000
5. Modifications to Fire Alarm & Sprinkler Systems, Engine Research Building, Phase I (5&23)	950
6. Rehabilitate Mechanical and Electrical Systems, High Temperature Composites Laboratory (51)	750
7. Repair High Voltage Switchgear, Central Air and Equipment Building (64)	900
8. Mercury Clean-Up, Electric Propulsion Research Building (16)	900
9. Modifications to Alternate Propellant System, 10x10 Supersonic Wind Tunnel (85)	900
10. Construct Facility for Fuel Cell Testing (333)	1,400
D. Goddard Space Flight Center (GSFC)	13,100
1. Replace HVAC Equipment for Clean Rooms (7)	1,000
2. Repair Roofs, Various Buildings	800
3. Repair of Storm Drain System, Phase VI Wallops Flight Facility [WFF]	950
4. Rehabilitate Communication Ductbank System, Phase II, WFF	750
5. Modifications to Multi-Payload Processing Facility, Phase III, WFF	1,300
6. Rehabilitation of Building F-160, WFF	800
7. Rehabilitation of Building F-10, North Wing, WFF	600
8. Rehabilitation of Island Roads, WFF	700
9. Repair Low Voltage Electrical Systems, Various Buildings	600
10. Construct Balloon Launch Pad, Ft Sumner, NM, WFF	900
11. Repair High Voltage Electrical Systems, Various Buildings	800
12. Repair Fire Protection & Domestic Water Systems, Various Buildings	650
13. Modifications to E Complex, Phase I, WFF	1,450
14. Construct Addition to Visitor's Information Center, WFF	600
15. Renovation of Management Education Center Dormitory, WFF	1,200

E. Jet Propulsion Laboratory (JPL)	11,700
1. Upgrade Hydraulic Drive, 26M Antenna, Canberra, Australia	900
2. Modify Compact Antenna Measurement Range Building (212)	1,450
3. Construct Addition to Atmospheric Remote Sensing Laboratory (245)	650
4. Construct Addition to Microwave Front End Test Facility (238)	550
5. Construct Antenna Support Building, Madrid, Spain	600
6. Upgrade Gaseous Nitrogen Supply, Phase II	550
7. Modify Building 233 for Micro-Electro-Mechanical Systems	1,150
8. Refurbish/Upgrade Advanced Propulsion Test Facility (148)	600
9. Construct Extension to Frequency Standards Laboratory (298)	1,450
10. Construct Central Chilled Water System, Apollo Site, Goldstone	650
11. Refurbish Cafeteria (167)	1,450
12. Expansion of Multi-Media Facilities (186)	950
13. Repair Pavements, Various Roads	750
F. Johnson Space Center (JSC)	9,900
1. Refurbish Elevated Storage Tank and Miscellaneous Support Buildings	800
2. Replace Air Handlers, Communications and Tracking Development Laboratory (44)	1,000
3. Rehabilitate and Modify Life Sciences Laboratory Building, Phase I (37)	900
4. Repair Air Handlers, Project Management Building, Phase I (1)	1,100
5. Replace Roofs, Photographic Laboratory and Bioengineering Test Support Facility (8, 36)	1,200
6. Replace Loggia Ledge Coverings, Phase II, Various Buildings	1,500
7. Replace Roofs, Logistics Support Buildings (419, 421)	1,000
8. Replace Air Conditioning Systems, Various Buildings (36, 49, 354)	600
9. Replace Air Handlers, Mission Simulation Development Facility (35)	700
10. Repair and Upgrade Building Systems, White Sands Test Facility (300 Area)	1,100
G. Kennedy Space Center (KSC)	4,900
1. Safety Modifications to Pad A Hinge Column Crossover	500
2. Replace 15-KV Feeder 518/612, C5 to SS-900	1,000
3. Revitalize Secondary Power Systems, Vehicle Assembly Facility, Phase 2	900
4. Construct Replacement Air Traffic Control Tower, Shuttle Landing Facility	1,500
5. Construct Replacement Perimeter Security Gates	1,000

H.	Langley Research Center (LaRC)	10,000
	1. Upgrade Drive Control System, Transonic Dynamics Tunnel (648)	1,425
	2. Replace Heat Exchanger, 31-inch Mach 10 Tunnel (1251A)	1,400
	3. Modifications to 12-foot Low Speed Tunnel Main Drive (644)	700
	4. Replace Anechoic Absorber Material, Low Frequency Antenna Chamber (1299)	1,425
	5. Rehabilitate 2x3 Low Speed Boundary Layer Tunnel (1247H)	800
	6. Construct Second Floor for Work Force Consolidation (1216)	1,425
	7. Rehabilitate Central Computing Complex (1268)	1,425
	8. Construct Second Floor and Addition for Work Force Consolidation (1195)	1,400
I.	Marshall Space Flight Center (MSFC)	3,200
	1. Repair and Modify Process Water System, Michoud Assembly Facility [MAF] (117)	1,000
	2. Replace Roof, Component Ablator Facility, MAF (318)	800
	3. Replace Emergency Storm Drainage Pumps, MAF (106, 143, 304)	1,400
J.	Stennis Space Center (SSC)	9,300
	1. Rehabilitate Water Systems, Engine Test Complex	1,400
	2. Repair and Modernize HVAC, Environmental Laboratory, Phase II (1105)	1,100
	3. Increase Capacity and Expand GH2/GN2 High Pressure Distribution System, Phase II	1,300
	4. Modify Propulsion Test and Support Facilities, E Complex, Phase II	800
	5. Repair and Modernize Fire Alarm Systems, Various Facilities, Phase III	700
	6. Repairs to Structural and Mechanical Systems, B-2 Test Stand, Phase II	600
	7. Repair and Modernize Secondary Power Systems, Various Facilities, Phase III	900
	8. Repairs to High Pressure Piping System, Engine Test Complex	900
	9. Repair and Modernize HVAC, Test Complex	700
	10. Repair and Modernize 13.8KV Underground Cable	900

PROJECT TITLE: Facility Planning and Design
COGNIZANT OFFICE: Office of Management Systems LOCATION: Various

FY 02 COST ESTIMATE (Thousands of Dollars)	15,100
Project Elements:	
Master Planning	400
Sustaining Engineering Support	1,000
Project Planning and Design Activities	13,700

These funds are required to provide for advance planning and design activities; special engineering studies; facility engineering research; preliminary engineering efforts required to initiate design-build projects; preparation of final designs, construction plans, specifications, and associated cost estimates; and participation in facilities-related professional engineering associations and organizations as follows:

A. Master Planning 400

The NASA field installation master plans need to be periodically updated. The master plans are essential as reference documents for land use planning, identification of physical relationships of facilities, and proper orientation and arrangement of facilities. The updates reflect as-built condition of facilities and utility systems with emphasis on changes caused by recent facility construction and modifications.

B. Sustaining Engineering Support 1,000

Provisions for facility studies and specific engineering support continue in importance as evidenced in recent years. These efforts are important due to changing trends in construction equipment, materials, and fuels; the operation and maintenance costs for the physical plant; and energy conservation and efficiency. The following items are included:

1. Value Engineering, and Design and Construction Management Studies

Provides for critically important studies to improve the quality and cost effectiveness of NASA's facility components and construction practices, and to ensure that developing technology and industry best practices are incorporated into the agency's construction program. Also provides services necessary to predict and validate facility costs to aid in resources planning and studies to assess design and construction functional management.

2. Facility Operation and Maintenance Studies

Provides for studies and engineering support, where not otherwise provided for, at NASA field installations relative to functional management of maintenance, automated maintenance management systems, and facilities condition assessments. Included in this activity are field surveys to be conducted at selected NASA field installations to evaluate the effectiveness and efficiency of the operations and maintenance management activities, and to identify possible improvements in productivity.

3. Facilities Utilization Analyses

Provides for the analyses of agency-wide facilities utilization data covering (1) office and other types of building space; (2) designated major technical facilities; and (3) special studies comparing the utilization of technical facilities which are similar in type or capability, such as wind tunnels. Such analyses provide for (1) insights into and development of better methods of identifying underutilized facilities; (2) improved techniques to quantify level of facilities use; (3) actions to improve facilities utilization; and (4) recommendations regarding consolidation/closure of Agency facilities.

4. Facilities Management Systems

Provides for continued engineering support for the technical updating of NASA's master text construction specifications to reflect the use of new materials, state-of-the-art construction techniques and current references to building codes and safety standards. Also provides engineering support for the Major Facilities Inventory, the Real Property Database and the Facilities Utilization Database systems.

5. Capital Leveraging Research Activities

Provides for modest participation in facilities related professional engineering associations, institutes, and organizations established to bring together major facility owners, contractors, and academia in proven research and study efforts to improve the quality and cost effectiveness of facilities engineering management practices for member organizations. Such organizations include, but are not limited to the Federal Facilities Council of the National Research Council, Construction Industry Institute, Fully Integrated and Automated Technology Consortium, and National Institute of Building Sciences. This also provides for independent research activities to address facility problems unique to NASA.

C. Project Planning and Design Activities 13,700

These resources provide for project planning and design activities associated with Mission Support construction projects. Project planning and design activities for construction projects required to conduct specific Human Space Flight or Science, Aeronautics, and Technology programs or projects are included in the appropriate budget line item.

1. Preliminary Engineering (700)

This estimate provides for preparation of Preliminary Engineering Reports (PERs), investigations, project studies and other pre-project planning activities related to proposed facility projects. Construction of Facilities programs. These reports are required to permit the early and timely development of the most suitable project to meet the stated programmatic and functional needs. Reports provide basic data, cost estimates and schedules relating to future budgetary proposals.

2. Related Special Engineering Support (1,500)

This estimate provides for investigations and project studies related to proposed facility projects to be included in the subsequent Construction of Facilities programs. Such studies involve documentation and validation of 'as-built' conditions, survey/study of present condition of such items as roofing and cooling towers, utility plant condition and operational modes, and other similar field investigations and studies. These studies are required to support long term project development strategies, and project specific designs, cost estimates, and schedules.

3. Design (11,500)

The amount requested will provide for the preparation of designs, plans, drawings, and specifications necessary for the accomplishment of construction projects. Also provides technical and engineering support analyses, designs, and reviews required to verify, confirm and ensure suitability of construction designs within the project cost estimates. This work is associated with construction proposed for the FY 2004 program and with changes to projects proposed for the FY 2003 program. The goal is to obtain better facilities on line earlier at a lower cost.

Total Facility Planning and Design 15,100

PROJECT TITLE: Environmental Compliance and Restoration Program
COGNIZANT OFFICE: Office of Management Systems, Environmental Management Division LOCATION: Various Locations

FY 02 Cost Estimate (Thousands of Dollars)	57,000
Location:	
Ames Research Center	1,500
Dryden Flight Research Center	600
Glenn Research Center	16,930
Goddard Space Flight Center	325
Jet Propulsion Laboratory	7,735
Johnson Space Center	2,220
Kennedy Space Center	7,460
Langley Research Center	1,130
Marshall Space Flight Center	5,900
Michoud Assembly Facility	1,750
Stennis Space Center	870
Wallops Flight Facility	280
White Sands Test Flight Facility	6,400
Headquarters	3,900

PROGRAM DESCRIPTION:
The Program provides for environmental activities necessary for compliance with environmental requirements including environmental program initiatives. Proposed environmental activities for FY 2002 are identified below under "ENVIRONMENTAL ACTIVITIES COST ESTIMATE" title. The Program includes activities necessary for NASA to comply with environmental statutory and regulatory requirements and standards, orders, regulatory and cooperative agreements, and support of environmental program initiatives. The Program focuses our efforts in the principal areas of environmental compliance, remediation, conservation, pollution prevention and closures. Within this framework, compliance with environmental requirements is performed, while simultaneously remediating previously contaminated sites, performing environmental closures, and promoting the identification of pollution prevention and conservation activities. The resources authorized and appropriated pursuant to this Program may not be applied to other activities. Program activities include projects, studies, assessments, investigations, plans, designs, related engineering, program support, and sampling, monitoring, and operation of remedial treatment processes and sites as part of the remediation and cleanup measures. These activities will be performed at NASA installations, NASA-owned industrial plants supporting NASA activities, and other current or former NASA sites where NASA operations have contributed to environmental problems and NASA is obligated to contribute to cleanup costs. In addition, these resources will be used to provide for activities including regulatory agency oversight costs, to acquire land if necessary to implement environmental compliance and restoration measures, and to perform studies, assessments and other activities in support of functional leadership initiatives related to the environmental program.

PROGRAM JUSTIFICATION:
The Program represents this year's request on a phased approach in relation to the total Agency requirements for environmental remediation measures that must be implemented within the next several years, as well as for needed requirements for other environmental compliance measures and initiatives. The Program includes activities necessary for compliance with environmental statutory and regulatory requirements and standards, orders, regulatory and cooperative agreements, and support of environmental program initiatives. Based on relative urgency and potential health hazards and safety, these activities are the highest priority requirements currently planned for accomplishment in FY 2002. Deferral of these necessary compliance and remedial measures would preclude NASA from complying with environmental requirements and regulatory agreements, and jeopardize NASA operations. As studies, assessments, investigations, plans, regulatory approvals, and designs progress and as new discoveries or regulatory requirements change, it is expected that priorities may change and revisions to these activities may be necessary.

The broad environmental categories summarizing the efforts proposed to be undertaken with the identified estimated costs are listed below. Remediation activities include one or more phases of a site cleanup program from site identification to final closeout, including but not limited to site assessments, site investigations, interim cleanup actions, testing and evaluation, remedial treatment systems and processes operation, sampling and monitoring, and other activities associated with CERCLA/RCRA cleanup requirements.

a. Environmental Remediation Activities and Initiatives --- Remediation (e.g. CERCLA, RCRA) .....$ 33,725
b. Other Environmental Compliance Requirements and Initiatives ---
Compliance, Restoration, Prevention, Closures (e.g. CAA, CWA, RCRA, ESA, AEA, PPA) .....$ 23,275

CERCLA = Comprehensive Environmental Response, Compensation and Liability Act
RCRA = Resource Conservation and Recovery Act
CAA = Clean Air Act
CWA = Clean Water Act
ESA = Endangered Species Act
AEA = Atomic Energy Act
PPA = Pollution Prevention Act

ENVIRONMENTAL ACTIVITIES COST ESTIMATE (Thousands of Dollars):
The activities that comprise this request are as listed below by location.

A. Ames Research Center (ARC)	1,000
1. Remediation of Area of Investigation 11	500
2. Remediation of Area of Investigation 4	500
B. Dryden Flight Research Center (DFRC)	600
1. Remediation of Soil/Groundwater Contamination	600
C. Glenn Research Center (GRC)	16,700
1. Remediation of Contaminated Areas	700
2. Plum Brook Reactor Decommissioning (detailed description provided below)	16,000
D. Goddard Space Flight Center (GSFC)	200
1. Remediation of Landfills (4)	200
E. Jet Propulsion Laboratory (JPL)	7,615
1. Cleanup of Arroyo Seco Groundwater Contamination	6,915
2. Pasadena and Lincoln Avenue Agreements	700
F. Johnson Space Center (JSC)	1,600
1. Pretreatment of Hazardous Waste System Modification (8)	650
2. Closure of Impoundment and Relocate Sewer, Phase 2	550
3. Plating Shop Pretreatment	400
G. Kennedy Space Center (KSC)	2,300
1. Remediation at Fuel Storage Area #1 (CCAS)	800
2. Various Interim Measures, Various Locations (KSC and CCAS)	1,500

H. Langley Research Center (LaRC)	1,000
1. Upgrade of Heating Plant Concrete Tanks	1,000
I. Marshall Space Flight Center (MSFC)	5,310
1. CERCLA Investigation and Cleanup	4,500
2. RCRA Investigation and Cleanup, Santa Susana Field Laboratory	200
3. Groundwater Investigation and Cleanup, Santa Susana Field Laboratory	610
J. Michoud Assembly Facility (MAF)	1,700
1. Remediation Activities, Various Locations	1,700
K. White Sands Test Facility (WSTF)	6,400
1. Groundwater Contamination Assessment and Remediation	6,400
L. Studies, Assessments, and Investigations; Plans; Designs; Sampling, Monitoring and Operation of Remedial Treatment Systems; Related Engineering and Program Support, Various Locations	12,575
Total Environmental Compliance and Restoration Program	57,000

PROJECT TITLE: Plum Brook Reactor Decommissioning
INSTALLATION: Glenn Research Center
COGNIZANT OFFICE: Office of Management Systems
LOCATION: Plum Brook Station Sandusky, OH

FY 02 COST ESTIMATE (Thousands of Dollars):	16,000
Project Elements:	
Mobilization	1,000
Decommissioning, Demolition, Waste Management	8,000
Environmental, Safety & Health Support, Construction & Project Management, Community Relations, Institutional & Technical Support	7,000

PRIOR YEARS FUNDING*:	13,018
**FY 1998 – FY 2001:*	
Pre-decommissioning work	8,800
Plans, studies and samplings	4,218

PROJECT DESCRIPTION:
This project decommissions and demolishes the nuclear test reactor located in Plum Brook Station in Sandusky, Ohio. The reactor has been in standby mode since 1975. Work towards decommissioning began with the Nuclear Regulatory Commission required Decommissioning Plan in 1999. The decommissioning work will be performed in a phased approach and is expected to end in 2006 or 2007. The actual end date will depend on what is found as the decommissioning and demolition work evolves. In 2002, the primary work to be performed will be reactor building decontamination, removal of the reactor vessel internals, and waste management. Other activities include community relations; mobilization; environmental, safety and health support; and asbestos abatement. The current cost estimate to complete the decommissioning work, by 2006/2007, ranges from $150 to $175 million.

PROJECT JUSTIFICATION:
The Nuclear Regulatory Commission (NRC) is the regulatory agency requiring NASA to decommission the Plum Brook Reactor. NRC issues licenses for nuclear reactors. In 1998, the NRC, through the Plum Brook Station reactor license, directed NASA to decommission the reactor by 2007. The reactor has been without nuclear fuel and in mothball status since 1975. Decommissioning activities are required by NRC regulations under 10 CFR 20.82 (b) and 10 CFR 50.

IMPACT OF DELAY:
Delay of the project would cause NASA to be in violation of Nuclear Regulatory Commission (NRC) requirements. The NRC has notified the American public of the decommissioning, and the Ohio delegation and Sandusky Ohio community have been directly contacted with the projects overarching goals, objectives, and target end dates. Delay of this project would prevent NASA from honoring these commitments and jeopardize NASA's credibility with the community.